Chemical & Engineering NEWS
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Employment Outlook 1983
Chemists and chemical engineers: How do they differ? Page 37
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Fatty acid makers bullish on outlook

Fatty acids currently are struggling with slow markets and soft prices; upbeat on future, however, several producers are adding capacity

Patricia L. Layman
C&EN, New York

The fatty acid industry historically has been somewhat sheltered from economic downturns, because it is such a diverse business. Few end-use applications take more than 10% of the total, so if one end-use market is down, others usually hold up to keep the entire business from hurting too much.

But in the current recession, that hasn't happened. Over the past year, "business hasn't been all that good," as one marketer puts it.

On the other hand, the fatty acid business probably isn't in the grim category, because some producers do see some bright spots. And they see some even brighter spots for the future, when the economy turns around and some of the major end-use markets for the chemical industry—housing and automotive, for example—begin rebounding.

For now, fatty acid makers are trying to cope with slow markets and soft prices. Fatty acids is basically a mature business, growing at about the same rate as that of the gross national product, or perhaps even slightly less. Present consumption is probably about 1.65 billion lb annually, with little growth expected this year.

But with an eye on the future, several producers are expanding their operations. For example, Emery Industries, subsidiary of National Starch & Chemical, is in the middle of a $50 million expansion of its fatty acid production complex at Cincinnati. It expects the unit to go on stream late next year.

Witco's Humko Chemical division this spring launched an expansion of its Memphis plant to boost capacity for primary and secondary fatty amides about 50%. The expansion is scheduled for completion next spring.

And Glyco, a Greenwich, Conn.-based specialty chemicals producer, is nearing completion of a major expansion of its Painesville, Ohio, fatty acid operation, a move that it says will make it one of the largest producers of fatty acids in the U.S.

There is even a new player in the game—CasChem of Bayonne, N.J. CasChem was formed late last year to buy out NL Industries' fatty acid business, among others.

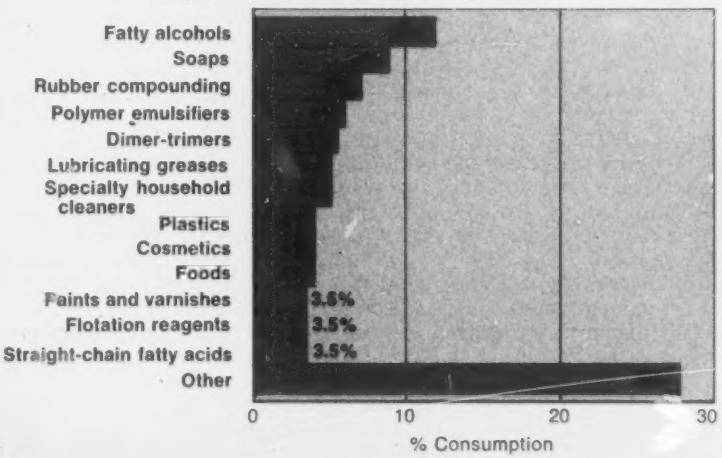
Conversely, the largest producer of fatty acids—Procter & Gamble—is standing pat with its 10 plants in the U.S. and Canada. P&G won't comment on how it views the current situation for fatty acids. However, it does point out that the situation often parallels that for general segments of the economy such as housing and automotive, which affect the fatty acids business.

Gulf Oil, which is reshuffling its chemical interests, is said to be trying to sell its Millmaster Onyx subsidiary, which includes the A. Gross fatty acids division, to concentrate on other chemical businesses. Ironically, the move to sell the subsidiary comes at the same time that A. Gross has embarked on a five-year marketing and sales plan that includes doubling its capacity for fatty acids and derivatives by 1987.

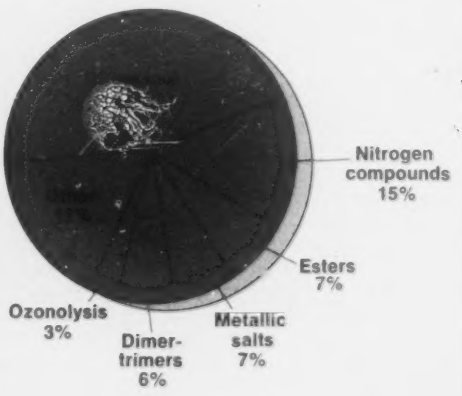
One of the factors holding down prices—and profits—in the industry is simply that sales are slow. In addition, prices of fatty acids are being held down by the abundance of raw materials currently facing the industry. Tallow, one of the major raw materials, currently is priced in the

Diversity marks the fatty acid business

Fatty acid markets are highly fragmented



Where fatty acids go



Source: R. M. Hull & Co.

Total 1981 consumption = 1.6 billion lb

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Fatty acid producers see big potential for synthetic lubes such as Mobil 1

teens, down from more than 30 cents per lb, and coconut oil, another primary raw material, has slipped from a high of about 60 cents to less than 20 cents per lb. Customer pressure forces these price drops to be reflected in the price of fatty acids.

Fatty acid prices also are being affected by the depressed prices for one of the major forms of fatty acids, tall oil fatty acids. Tall oil fatty acids are coproducts of tall oil resins, which have been in demand lately to replace petroleum resins for a variety of specialty applications, particularly in adhesives. As one industry observer explains it, the demand for resin esters is up, encouraging more production. This means more production of tall oil fatty acids, which producers must then get rid of—and a low price usually is the easiest way.

The price and profit situation leads consultants at R. M. Hull & Co., Greenwich, Conn., who follow fatty acids, to have a somewhat jaundiced view of the business. "Off the top, it looks pretty grim," says R. M. "Pete" Hull, president of the firm. The growth rate up to 1980 had been running at about 2.2% per year, he says; and is expected to increase slightly to about 2.9% per year through 1985. "It's dynamically slow, like molasses," he says.

However, even with all the problems facing the industry, some producers maintain that there are bright spots waiting for growth. And they defend the seeming unwisdom of plant expansions, authorized and begun in better economic times.

"Actually, these show good timing," insists one marketer. "We usually build when product is scarce, and then the bottom falls out of the market. This time, most of this new capacity will be coming on stream in 1983 and 1984, when things have turned around, and we will need it."

The major market that most fatty acid producers have their sights on is synthetic lubricants. It was the synthetic lubricant market that lured Celanese into the business in 1978 with its 40 million lb-per-year plant for producing heptanoic and pelargonic acids.

To date, however, this market has not developed the way many observers expected—or perhaps hoped—it would. "It's been a disappointment—it sure hasn't been the growth market we all thought," says one marketer. The major reason, one producer believes, is the lack of acceptance in the automotive market. He cites the reluctance of oil companies, with the obvious exception of Mobil Oil with its Mobil 1 lube, to put together synthetic formulations, or include the naturally derived fatty acids and derivatives in petroleum formulations. "We see the light at the end of the tunnel, but the tunnel keeps getting longer," he adds.

Instead of the mass automotive markets, synthetic lubricants have found specialty niches in such industrial applications as general chemical processing and in aircraft.

In addition to synthetic lubricants, fatty acid producers see potential in a variety of different markets. For example, some are working with formulators to develop cutting fluids to replace those based on mineral oil. The advantages offered are better performance and environmental behavior—resistance to oxidative degradation and fewer disposal problems because the synthetic fluids are water-based.

The humble candle also is coming in for some attention. Stearic acid long has been used in candles. At one point, 100% stearic candles were an alternative to beeswax; then stearic lost out to paraffin wax. Stearic still is used in small concentrations in most paraffin candles to promote more-even burning. Now, however, some candle makers are going back to 100% stearic acid candles because paraffin prices have gone up. Economics are the major driving force, but some argue that the resulting candles are a better product.

Other producers cite cosmetics as a promising area for improved growth for fatty acid esters in particular. "Cosmetics are not recession-proof, we have to concede that now," says one producer. "But they are recession resistant, and naturally derived fatty acids and derivatives will continue to grow in this area."

Fatty acid producers generally agree that the more specialized they can make their products—specialty derivatives, for example—the greater the chance for success. To some extent, that's difficult. "Fatty acid technology is old and grass-roots," says one marketer, "and with the business not growing very fast, it is difficult to make a high return on investment even with forward integration into derivatives."

Nonetheless, that's the course of action most producers are counting on—that, and the fact that their products have what they see as a plus in naturally derived, renewable raw materials.

One producer cites the proposed Conoco detergent-alcohol plant as an example. Conoco already has a 135 million lb-per-year alcohol plant, fed with petrochemicals. Prior to its merger with Du Pont, however, it had plans for a similar or slightly smaller plant to be fed with natural materials (C&EN, Jan. 11, page 13). "The only reason Conoco has that on the back burner is because of the Du Pont acquisition—they are short of cash," he says. "But they remain very strong on it. They can see the justification for it, as insurance so they can move in either direction."

"People have been looking at petrochemicals as building blocks," says a market development manager, "and now they will be looking more at tallow." At least, that's what fatty acid producers are hoping, as they add to now-abundant capacity while waiting for a pickup in demand in the coming years. □

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Canada sees lucrative styrene export market

Already significant exporter of monomer, Canada will nearly double capacity by 1985; best markets will be the U.S. and Far East

It is pretty difficult to find an optimist in today's styrene business. Difficult, but not impossible, especially if you look in Canada.

One such optimist is Harry V. Blair and it's not fair to say that he is optimistic only because his company isn't in the styrene business. It soon will be.

The Canadian government doesn't report styrene production, but it does give figures for polystyrene, the monomer's primary outlet. Through the first seven months of this year, Canadian polystyrene production has been running 6% ahead of last year's, but output of other major thermoplastics has been down anywhere from 3 to 15%.

More important, Blair, business center manager of aromatics for Shell Canada Chemical Co., Toronto, says that Canada will emerge from the 1980s as one of the very few major styrene exporting powers in the world.

The U.S., still a volume styrene exporter, will become, instead, a large styrene importer. Western Europe, Latin America, and the Far East will become even larger importers than they are now. These areas represent lucrative export targets for those countries that can produce styrene economically over and above their own domestic needs.

Canada will be one of those countries, Blair told a session on marketing Canadian petrochemicals at a meeting of the Canadian Society for Chemical Engineering in Vancouver, B.C.

Canadian styrene producers won't have the field to themselves. By the mid-1980s, Blair expects Mexico to bring its production and consumption into balance. And, by the late 1980s, Mexico could become a net styrene exporter. That, of course, depends on how rapidly Mexico restores its economy and puts its petrochemical plant-building program back on track.

Saudi Arabia also will be a major contender for future styrene export markets. Blair expects Middle East (including Africa) styrene capacity to be 315,000 metric tons, including a hefty 295,000 metric tons of Saudi capacity due on stream in 1985 or 1986.

Despite the potential competition from Mexico and the Middle East, Canada should be able to get a head start in the international marketplace. It already is a significant styrene exporter; it sent an estimated 100,000 metric tons out of the country last year.

Canada's present styrene capacity is 465,000 metric tons. Polysar has a 385,000-ton plant and Dow Chemical Canada has an 80,000-ton unit, both at Sarnia, Ont. But consumption is only slightly more than 200,000 metric tons (1981).

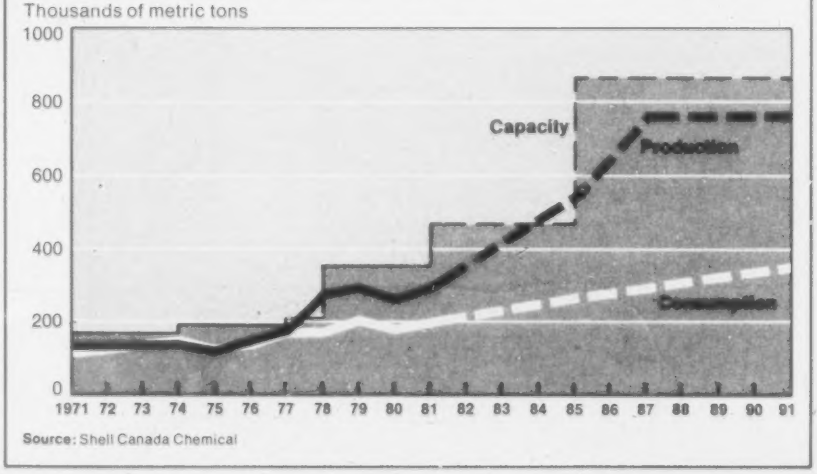
By 1985, before either Mexico or Saudi Arabia will be able to grab an international styrene toehold, Canada will almost double its styrene capacity. Shell Canada will have its 300,000 metric-ton unit on stream at Scotford, Alta., in 1984. And by 1985, Dow could have a 100,000 metric-ton expansion ready at Sarnia. There's some doubt about whether this expansion actually will be built, but so far the company hasn't said that it will be canceled. Blair figures that it will be part of Canada's styrene picture in 1985.

What he is not pumping into the supply side of his styrene equation, however, is a 400,000 metric-ton plant that had been proposed for Bruderheim, Alta. This unit was to have been a joint effort of Alberta Energy Co. Ltd. and Esso Chemical. Esso has pulled out of the project and AECL still is looking for a new partner. Although the project has received approval from the Alberta government, it is on hold and plans are indefinite.

Canada's styrene demand will not keep pace with this huge capacity increase. Blair estimates that demand, led by polystyrene, will increase an average 8.1% per year between 1981 and 1985. Then market growth will slow to a 4.5% annual rate through 1991. These rates indicate that Canadian styrene producers probably will be able to market 277,000 metric tons on their home turf in 1985 and 361,000 metric tons in 1991.

These rates also mean that, in 1985, Canadian styrene producers will be in a position to sell as much in the export market as they will in their domestic market. By 1991, exports will exceed domestic sales. Blair pegs the 1985 and 1991 export potential at 275,000 metric tons and 417,000 metric tons, respectively.

Canada will have plenty of styrene available for export



Source: Shell Canada Chemical

The big question, of course, is where will all of this Canadian styrene go? Blair thinks it can find profitable markets in the U.S. and Far East. Some will go to Western Europe, although he concedes that Europe is a logical market for Middle East styrene when it becomes available.

The U.S. has been a perennial heavyweight in styrene exports, with export volume running between 400,000 and 500,000 metric tons since the mid-1970s. The U.S. will continue to be a major factor in world exports until 1985. Then its styrene exports will start dwindling. By 1988, Blair thinks that the U.S. will become a net styrene importer.

Indeed, by 1991, the U.S. likely will be importing about 460,000 metric tons of styrene. And the U.S. market will be gobbling up virtually all of Canada's styrene exports.

Until then, the Far East will remain a hefty outlet for Canadian styrene. Japan, which has been a small net exporter, will satisfy virtually all of its own domestic demand until the mid-1980s. Then it will require a small amount of imports.

Japan's high-priced feedstocks will prevent it from participating in the export market, even though it will have excess capacity.

The remainder of the Far East, including Australia, historically has been a styrene importing area. It has had adequate capacity, but it can't compete with lower-priced U.S. and Canadian material.

Between 1981 and 1985, 475,000 metric tons of new capacity is scheduled to come on stream in the Far East. These newer plants will make the region more competitive with most exporting countries, says Blair. The possible exceptions are Saudi Arabia and Canada. By 1991, he figures that the Far East will be importing 447,000 metric tons of styrene.

Meanwhile, Western Europe's dependence on styrene imports will grow phenomenally. Blair says its styrene imports will rise from last year's 107,000 metric tons to 858,000 metric tons in 1991.

Canadian styrene producers, then, should have an excellent opportunity to capitalize upon its export potential. Blair sees a worldwide shortage of styrene developing by 1988.

Between 1980 and 1991, he expects world demand to increase an average 4.6% per year, whereas capacity will trail at only 1.8% per year. That combination spells good business for a country that has competitive, surplus styrene capacity. □

Canadian ammonia faces some big hurdles

Alberta, linchpin of western Canada's ammonia industry, will play host next year to almost 900,000 metric tons of new ammonia capacity.

On the surface, the timing couldn't be worse. The world fertilizer industry is limping through one of its worst business slumps. Demand is down. Plants are being shuttered—some temporarily, others permanently. Sharply lower prices can't keep many producers at the break-even level.

Still, says R. E. Ward, if western Canada ammonia producers can struggle through the next few years, they should emerge around the mid-1980s in pretty good shape.

Ward, who is planning and business development manager, chemical and fertilizer marketing, for Cominco Ltd., also has another big "if." He told a recent meeting of the Canadian Society for Chemical Engineering in Vancouver, B.C., that much depends on the natural gas situation in Alberta.

More than 90% of western Canada's ammonia capacity has been built in Alberta because of the province's huge, economical supply of natural gas. Feedstock represents about 80% of ammonia production costs. Whether or not Alberta producers will be able to compete effectively with U.S.-produced material and overseas production competing with Canada for a share of the U.S. market depends on Alberta natural gas prices.

Past forecasts of higher world oil prices and higher U.S. natural gas prices indicated that Alberta's natural gas price would give ammonia producers there a sizable feedstock advantage. They need it to offset higher transportation costs.

This advantage has narrowed as world energy prices have softened and as Canadian energy policies have made natural gas more expensive in Alberta.

Still, Ward thinks that prospects for Alberta's ammonia producers are bright. Demand in their own backyard, the grain-producing provinces of western Canada, is strong.

Ward expects nitrogen fertilizer demand in western Canada to increase 6.5% per year through the 1980s. Factoring in nonagricultural uses, western Canada's requirements will jump from 753,000 metric tons last year to 1.5 million metric tons in 1991.

By comparison, nitrogen demand in the U.S. probably will grow only 1.5 to 2% annually. However, even this growth is important to Alberta's producers because the U.S. is the only other major market for their ammonia. Canada has no port facilities to handle liquid ammonia; it must be sold on the continent.

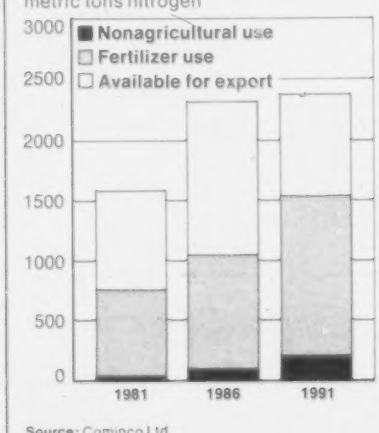
Last year, western Canadian ammonia producers had about 815,000 metric tons (as nitrogen) available for export. Export potential, however, will increase as new plants come on stream in Alberta next year. Esso Chemical Canada is bringing on a 540,000-metric-ton plant at Redwater, Alta., and Sherritt Gordon Mines Ltd. also will finish its 340,000-metric-ton ammonia plant at Fort Saskatchewan early next year. Both projects have accompanying urea plants.

These units, along with a modest expansion at Simplot Chemical's Brandon (Manitoba) plant, will raise western Canada's capacity to 1.9 million metric tons. Ward says the new capacity will raise producers' ability to export from last year's 815,000 metric tons to almost 1.3 million metric tons by 1986.

However, if no additional ammonia plants are built in western Canada, Ward points out that growing domestic demand will take a big slug of the material available for export markets. Without new plants, he says that export potential by 1991 will be right back to where it was last year.

But Ward also suspects that new plants will be built. He's expecting at least two new ammonia units in Canada—one in Alberta and one in British Columbia. □

Nitrogen fertilizer export potential will decline



Source: Cominco Ltd.

1983 Employment Outlook

Career Opportunities for Chemical Professionals

This year is discouraging for many chemists and chemical engineers seeking employment. Because of the general economic slowdown, employers clearly have reduced their recent hiring of chemical professionals.

This is borne out by a decrease in the number of job offers received by inexperienced graduates. According to an ACS study, the average new B.S. chemist received 1.17 job offers in 1982, down from 1.44 offers in 1981, and the average new Ph.D. chemist got 2.12 offers in 1982 (2.24 in 1981). For chemical engineers, the decline is more marked. The average new B.S. chemical engineer received 2.20 offers in 1982, compared to 3.68 in 1981. The average new Ph.D. chemical engineer got 3.24 offers in 1982, down from 5.53 the previous year.

Universities report that, although the employment situation for their graduating chemists and chemical engineers was good in the fall of 1981, a sharp downturn occurred about the first of 1982.

Many campus observers believe the hiring outlook for the 1982–83 academic year is highly uncertain. They are hoping that an improvement in the economy will push up the demand for chemical professionals, although some observers are far from optimistic.

An ACS study finds that, between 1981 and 1982, the median annual starting salaries of inexperienced chemists decreased 1% for B.S. graduates and increased 12% for M.S.s and 10% for Ph.D.s. Among inexperienced chemical engineers, starting salaries rose 9% for B.S.s, 11% for M.S.s, and 11% for Ph.D.s.

These are some of the findings of C&EN's latest report on the employment situation for chemical professionals, prepared by senior editor Howard J. Sanders.

Chemical Engineers

Chemical engineers typically draw higher salaries than chemists, despite equal amounts of training and job experience. Engineers usually require less academic training than chemists because they are less apt to do independent research. **Page 38**

Salaries

The median annual salaries of experienced and inexperienced chemists and chemical engineers rose moderately this year, except for a slight decrease for inexperienced B.S. chemists. Inflation, however, appreciably eroded the gains. **Page 49**

Demand

Demand for chemists and chemical engineers this year is decidedly less than in previous years, as a result of the deep business recession. New college graduates are receiving fewer job offers, and some still are looking for suitable employment. **Page 43**

Career Planning

Much information for people considering careers in chemistry or chemical engineering is available from ACS and other organizations. A directory provides names and addresses of many employers of chemical professionals. **Page 52**

Chemical Engineers

Linked by chemistry, chemists and chemical engineers differ in many ways, including schooling and pay

Chemists and chemical engineers share a mutual bond in chemistry. But the two professions are quite different.

Chemists are most likely to work in research laboratories; chemical engineers in manufacturing plants. The work of most chemists requires a Ph.D.; chemical engineers generally find B.S. training sufficient. Chemists usually work with small amounts of materials, using scientific instruments; chemical engineers deal with large volumes and production-scale equipment. The job of the research chemist is to uncover new knowledge; the typical chemical engineer solves practical problems using existing knowledge. Not the least of the differences between the two: chemical engineers tend to be better paid. Why do chemical engineers generally earn more money than chemists, even if both have the same number of years of university training and professional experience?

The salary difference is large. A survey by the American Chemical Society shows that the median annual starting salary of inexperienced B.S. graduates this year is $26,500 for chemical engineers—56% higher than that for B.S. chemists.

An earlier ACS study, covering members at all professional experience levels, shows that, as of March 1982, the median annual salary of B.S. chemists was $28,500 and that of B.S. chemical engineers was $40,000—40% more. The latter figure is somewhat distorted, however, because ACS-member chemical engineers are a somewhat older and thus more experienced group than chemical engineers in general, as shown by data from the American Institute of Chemical Engineers, whose members are more representative of the total chemical engineering profession. Thus, in March 1982, the median annual salary of AIChE members (encompassing all degree levels) was about $39,000, whereas the median annual salary of ACS-member chemical engineers was $42,000.

The most common explanation for the higher salaries paid to chemical engineers can be summed up by the terse statement: "Supply and demand." For employers to compete in the hiring marketplace, they have to pay more for the scarcer "commodity"—chemical engineers.

Since, for some years now, chemical engineers have been in relatively short supply and have been paid comparatively high salaries, why don't more young people choose careers in chemical engineering? One explanation is that many young people are not aware of the salaries paid to chemical engineers or of the demand for them. In fact, some young people seem to be aware only vaguely that the chemical engineering profession exists.

Many high school students take courses in chemistry and so are moderately familiar with the work that chemists do. And many young people also have chemistry sets and, through them, have developed a liking for the subject. No courses in chemical engineering are offered in high schools, and no kits are on the market to show young people what the field is like. And whereas at least a few movies, television programs, and best-selling books have described what chemists do, the same cannot be said for chemical engineers.

Another factor discouraging young people from obtaining degrees in chemical engineering is that the chemical engineering curriculum is regarded widely as one of the toughest on many campuses. Says one chemical engineering professor, "When I was going to college and mentioned that I was majoring in chemical engineering, the usual response was an offer of condolence." Its reputation for being especially difficult steers many students away from engineering.

Course work leading to a B.S. in chemical engineering generally is more strenuous than that leading to a B.S. in chemistry. The chemical engineer is required to take a greater number of technical courses than is the chemist. As a whole, the courses for chemical engineers often are more challenging intellectually, involve more mathematics, and require longer hours of homework. Chemical engineering professors also are prone to set high grading standards. In addition, the chemical engineering curriculum includes fewer nontechnical electives than that of the chemist, which may be less demanding than the technical electives of chemical engineers.

Freshman enrollments in chemical engineering in recent years have been increasing rather dramatically, nevertheless. This is reflected in the number of B.S. degrees awarded in the past few years, which has climbed from 3581 in academic year 1976–77 to 6527 in 1980–81. The increase is attributable largely to a growing student awareness that chemical engineers are in high demand and are relatively well paid. Admittedly, the demand for these graduates decreased this year because of the nation's severe recession. But this decline is expected to be only temporary.

C&EN staff photo

Cheh: Surplus of chemical engineers is not expected in the foreseeable future

The sharp rise in the output of new B.S. chemical engineers in the past few years has led some observers to wonder whether a surplus will develop, resulting in a leveling off, if not a decline, in starting salaries. Most observers, however, do not believe that a significant oversupply will occur.

One reason is that the rise in the supply of chemical engineers has been accompanied by an increase in demand not only by the chemical industry but also in such fast-expanding fields as the development of new energy sources and the creation of better ways to protect the environment.

Huk Y. Cheh, chairman of Columbia University's department of engineering and applied chemistry, declares, "I do not expect a surplus of chemical engineers to develop in the foreseeable future because the industries that employ them are vital to the nation's economy. On the other hand, a chemical engineering senior nowadays may get only one or two job offers, whereas he or she in former years might have gotten three or four."

C&EN staff photo

Han: Companies can put chemical engineers' training to effective use

Many chemical engineering departments are putting a firm lid on their enrollment of freshman students. The reasons are mainly the shortages of chemical engineering faculty members, lecture room space, and laboratory facilities. In view of the scarcity of funds in the present tight economy, chemical engineering departments are not likely to add new wings onto their present buildings to accommodate an overabundance of students.

One observer notes, "Especially hard hit have been the state universities. They have been faced with cutbacks in funding not only because of the recession but because of the public's widespread tax revolt and the stiff competition for state funds by other public programs. Hence, many state universities simply cannot handle a sharp rise in enrollments."

The University of Maryland's college of engineering last year set up an enrollment limitation plan. In academic year 1981–82, freshman enrollments in the various engineering departments were reduced one third from the previous academic year.

This type of curtailment also is being imposed in many other engineering schools. The restrictions help the schools provide quality education for their students and enable them to stay within their limited budgets. In August, the engineering deans council of the American Society for Engineering Education unanimously passed a resolution recommending that engineering schools limit or even decrease their enrollments to prevent faculty shortages and crowded classrooms from impairing engineering education.

The shortage of chemical engineers is only one factor behind the higher salaries that they earn. Chang Dae Han, head of the chemical engineering department at Polytechnic Institute of New York, says, "I believe that another reason is that the professional work of B.S. chemical engineers is less routine and more demanding than that of the usual B.S. chemist. Also, chemical engineers are more broadly trained in areas that companies can put to effective use. Compared to a B.S. chemist, a B.S. chemical engineer knows much more about such commercially useful matters as heat transfer, fluid flow, mass transfer, chemical reaction kinetics, process automation, equipment design, and process economics."

Others believe that employers attach a higher value to chemical engineers because they are viewed as more production-minded, more cost-conscious, and more management-minded than are chemists. Hence, they are in a better position to move eventually into high-level executive jobs.

Dale B. Fox, manager of university relations and professional employment at Monsanto, says, "Offhand, I can think of several B.S. chemical engineers in our company who are plant managers. On the other hand, I can think of no plant managers in our company who are B.S. chemists."

Some people, such as James M. Bobbitt, chemistry professor at the University of Connecticut, believe that chemical engineers are more highly paid than chemists because their work brings their employers a more immediate payoff. Clearly, the activities of a chemical engineer are more closely tied to the finished, marketable product than are those of the research chemist.

Alexis T. Bell, chairman of the chemical engineering department at the University of California, Berkeley, comments, "Industry places a higher premium on chemical engineers than on chemists because chemical engineers can deal with a broader range of problems that have a direct bearing on a company's profitability. For example, a chemical engineer, unlike a chemist, is concerned about the cost of raw materials

Fox: Some B.S. chemical engineers are promoted to plant managers

and can develop the most economical route to a given chemical end-product."

Other observers say that chemical engineers are more valuable to employers because they are more versatile than chemists. This greater versatility, says John H. Seinfeld, executive officer for chemical engineering at California Institute of Technology, stems from the fact that chemical engineers must carry a heavy course load in both chemistry and chemical engineering. "As a result," he notes, "they can function as both chemists and engineers. Thus, they can work effectively in many different types of jobs."

Chemical engineers are said to have certain highly desirable personality traits, such as the ability to make quick decisions and to function well with many different types of people—traits found less often among chemists.

Another reason sometimes given for the higher salaries paid to chemical engineers is that their jobs often place them in positions of higher responsibility—both in terms of people and money. Chemists often work alone or supervise only a small group of people in a laboratory; a chemical engineer may supervise dozens of people in a chemical plant. And whereas a chemist may be responsible for $20,000 worth of research equipment, a chemical engineer may be in charge of operating a $20 million plant.

Fox of Monsanto observes, "Compared to B.S. chemists, B.S. chemical engineers have to do a lot more immediate and independent decision making. And often this decision making, which customarily relates to plant operations rather than to laboratory operations, involves substantial sums of money."

An intriguing question is whether chemical engineers actually have personalities that differ from those of chemists.

Many people think that personality differences between the two groups are quite minor. Columbia's Cheh thinks "it is absurd to generalize about differences in the personalities of chemists and chemical engineers. Obviously, there is enormous diversity in both groups."

Nevertheless, some people do see differences. The chairman of the chemistry department at a major university says, "I have been studying the personalities of chemists and chemical engineers for more than 30 years now, and I definitely see differences. The chemical engineers as a group appear to be more emotionally and physically mature than the chemists—at least at the undergraduate level. They tend to be more aggressive. They are more confident about their vocational goals. They generally are less patient and thus more likely to expect quick results."

Seinfeld: Versatility stems from knowing both chemistry and engineering

Some observers say that chemical engineers tend to be more gregarious than chemists and more at ease in dealing with people at many different levels—everyone from maintenance workers and plant operators to scientists and company managers. On the other hand, chemists, they believe, tend to be more comfortable when dealing with their social and intellectual peers.

According to some people, chemical engineers have greater ability to make quick, well-reasoned decisions about relatively difficult problems. Hence, they tend to make better managers. They also are more people oriented and more cost conscious.

Some people claim, too, that chemical engineers are less interested in the humanities than are chemists. Joseph N. Cannon, chairman of the chemical engineering department of Howard University, says, "Our chemical engineering students take a few courses in the humanities, but quite a few of them loudly grumble about it—more so than do the chemists." In addition, he and some other observers believe that chemical engineers tend to be less verbal and to have poorer communication skills than do chemists.

Theodore W. Cadman, chairman of the chemical and nuclear engineering department of the University of Maryland, finds that chemical engineers tend to be less concerned than chemists about seeking political solutions to society's problems, preferring technological solutions instead. "In the Vietnam war years and later," he says, "relatively few of our chemical engineering students participated in campus protest demonstrations and other political efforts, whereas sizable numbers of the chemistry students were involved quite actively. One possible reason, of course, is that our engineers may have been too busy with their studies and may have been too preoccupied with preparing for their future professional careers to get involved in such extracurricular activities. I believe, however, that a more important reason is that chemical engineers generally are less interested than are chemists in getting involved in politics."

A notable trend in recent years has been the substantial increase in the number of chemical engineering graduates who are women. Some chemical engineering departments report that 20 to 25% of their B.S. graduating classes in the past two or three years have been women. In contrast, the University of Illinois at Urbana, for example, graduated very few women chemical engineers prior to about 1974.

Fifteen years ago, a woman chemical engineer—particularly one working in an industrial plant—was regarded as an oddity. Many chemical companies refused to allow women chemical engineers to do plant work because it was considered too strenuous or too dangerous. If a company hired a woman chemical engineer at all, it usually assigned her to a laboratory or office job.

All that has changed. Fox says, "Seeing a woman chemical engineer in a plant these days is no big deal." He points out that he has seen women chemical engineers climb ladders and walk across scaffolding as agilely as any male engineer.

Now many chemical companies are making a special effort to hire women chemical engineers. In 1981, median starting salaries of B.S. chemical engineers were $24,650 for women and a slightly lower $24,500 for men. In 1982, however, the median starting salaries of B.S. chemical engineers were $26,750 for women and a slightly higher $27,000 for men.

J. Charles Forman, executive director of AIChE, says, "Women are becoming increasingly interested in working as chemical engineers partly because they know that companies are eager to place them in interesting,

challenging, and well-paying jobs. They also know that their male coworkers will accept them. Seeing women chemical engineers working in a chemical plant with their clipboards, data sheets, hard hats, and electronic calculators has become commonplace."

Fox declares, "Companies are eager to place qualified women chemical engineers not only in conventional chemical engineering jobs but in higher-level positions as well. I'll bet that, in the near future, you will find women chemical engineers employed as plant managers and in even higher positions, even if a few workers initially may find this change a bit difficult to accept."

Companies also are attempting to hire more engineers from minority groups. Many observers believe that qualified, young, black chemical engineers stand a very good chance of obtaining satisfying jobs in industry. On the other hand, some blacks say that, once hired, they have found it harder to advance than do their white counterparts. This situation, however, appears to be improving, as more black chemical engineers are moving into management positions.

Clearly, blacks are underrepresented in the chemical engineering profession. Only 0.7% of the members of the American Institute of Chemical Engineers are black, despite the fact that 11% of the U.S. population is black. Part of the reason is that blacks in the past have felt that the field essentially was closed to them.

Cannon of Howard University says that another factor holding back the entry of blacks into the chemical engineering profession is their often inadequate high school preparation in chemistry, physics, and math. He adds, "The job opportunities for black chemical engineers are excellent. We almost always have decidedly more job offers for our chemical engineering graduates than we have applicants. In the many counseling sessions I have had with black high school students over the years, I have strongly encouraged them to go into chemical engineering—provided they have a liking for and an aptitude for chemistry, physics, and mathematics."

C&EN staff photo

Cannon: Job opportunities for black chemical engineers are excellent

Even though chemical engineering and chemistry are looked upon as two separate professions, no rigid line of demarcation actually exists between the two. Both fields rely heavily on chemistry.

As their experience grows, some chemical engineers do work that normally would be done by chemists. Conversely, chemists who pick up on-the-job experience or take courses in engineering may move into jobs typically done by chemical engineers.

In the pilot plants of many companies, chemists work alongside chemical engineers, often doing similar work. Sometimes it is difficult to tell one from the other. Eugene O. Gooding, a chemical engineer who is business manager for chlorine and caustic soda at Dow Chemical, says, "There is definitely a gray area between chemistry and chemical engineering, and the pilot plant is often a meeting ground for these two professions."

Van T. Boughton, vice president of W. R. Grace's industrial chemicals group, comments, "After people spend 10 or more years in industry, the significance of the title on their college degree tends to diminish. This is especially true when chemists and chemical engineers move into such fields as marketing or management."

For high school seniors and college freshmen who have a strong interest in both chemistry and chemical engineering, many career advisers recommend work toward a B.S. in chemical engineering. The reason is that such students, if they later decide they would rather have a B.S. in chemistry, already will have taken most of the required chemistry courses.

On the other hand, students who obtain a B.S. in chemistry and then decide they prefer chemical engineering find switching will be more difficult and time consuming because they will have to take many required engineering courses.

C&EN staff photo

Cadman: Search goes on for technological answers to society's problems

Some advisers urge that students majoring in chemistry who are debating whether they prefer chemical engineering, should get a summer job or a co-op job in industry to get some exposure to day-to-day chemical engineering work. Another suggestion is to take some of their technical electives in engineering.

Actually, some vocational guidance counselors and industry personnel administrators urge chemistry majors to take elective courses in chemical engineering, even if they definitely have decided on a B.S. in chemistry. Knowledge of chemical engineering is highly useful to chemists and improves their chances of finding industrial employment.

Not everyone agrees, however. Thomas M. Dunn, head of the University of Michigan's chemistry department, declares, "We have strongly resisted the efforts of companies to get us to inject chemical engineering courses into our chemical curriculum. We believe that our B.S. chemistry graduates should be primarily chemists and not a hybrid of a chemist and a chemical engineer. We train our B.S. chemists to be generalists."

Most chemical engineers have only a B.S. degree. On the other hand, the majority of chemists who work in research laboratories have Ph.D. degrees. Why do chemical engineers generally need less academic training?

A major reason is that a Ph.D. in chemistry or chemical engineering is

C&EN staff photo

Forman: More and more women chemical engineers are working in industry

needed mainly by people in these fields who do laboratory research. Since chemists typically do such research, they need a Ph.D. On the other hand, since most chemical engineers do not do laboratory research, they do not require a Ph.D. Obtaining such a degree would constitute overtraining.

Polytechnic Institute's Han comments, "Most chemical engineers get only a B.S. degree because employers find that B.S. training is sufficient for the type of work they customarily are expected to perform. Any additional training they may need usually can be gotten on the job."

Another explanation is that typical chemical engineers apply scientific knowledge developed by others. They are not called upon to invent a novel

Boughton: Significance of exact title on one's college degree diminishes

reactor or new distillation column but merely to design one, using information previously obtained by others or select a unit that already is available commercially.

Many chemical engineers, too, are involved in supervising plant operations or trouble-shooting. This work also does not require the breadth of scientific knowledge or creative ability demanded of research chemists and chemical engineers.

Few chemical engineering students, in fact, get Ph.D. degrees. In the academic year 1980–81, only 300 Ph.D. degrees were earned by chemical engineers in the U.S., compared to 6527 who received B.S. degrees in chemical engineering. Whereas the number of students obtaining B.S.s in chemical engineering has been increasing in recent years, the number getting Ph.D.s in this field has declined from a peak of 400 in 1973–74.

One reason for the decline is that the starting salaries are now so high that many chemical engineering students are strongly tempted to end their formal academic training at the B.S. level.

Moreover, students realize that in going for a Ph.D. they will lose the three or four years of relatively high income that they would receive if they took a job in industry.

Despite this initial loss, however, the total earnings of a Ph.D. chemical engineer over the course of a career almost always are greater than those of a B.S. chemical engineer.

Recruiters in both industry and academia point out that a great need exists now for more Ph.D. chemical engineers. Many industry people have indicated a keen interest in hiring more Ph.D. chemical engineers to do engineering research. Many of these engineers eventually will go on to positions in management.

University chemical engineering departments are in a particular bind at present. They have to cope with increasing enrollments in their undergraduate courses but are short of Ph.D. faculty members to teach them. According to Cheh of Columbia University, the typical U.S. chemical engineering department today has openings for about two faculty members—and is not particularly encouraged about the prospects of filling these positions.

Most Ph.D. chemical engineers take jobs in industry, where the salaries are higher than in academia. A problem for the universities is that a growing number of Ph.D. graduates are foreign born. Many have come to the U.S. from such countries as Taiwan, Korea, India, Iran, Iraq, and the Philippines.

Unfortunately, some are not sufficiently fluent in English to qualify as chemical engineering teachers in this country. And, although most of them would like to remain in the U.S., many cannot because the regulations of the Immigration & Naturalization Service force them to leave when their student visas expire.

A B.S. chemical engineer who wishes to get advanced academic training in chemical engineering but does not want to get a Ph.D. might well be advised to obtain an M.S. in the field. Getting this degree usually takes a year to a year and a half. The course work consists mainly of basic studies in chemical engineering and its applications, and may involve independent research leading to the writing of a thesis.

As can be observed occasionally on college campuses and in industry, a certain amount of joshing goes on between chemists and chemical engineers. Chemists may refer to chemical engineers as "nothing more than plumbers." Chemical engineers may speak of chemists as "just a bunch of test-tube pushers."

Some chemists, particularly research chemists, think of their work as more useful to society than that of chemical engineers. Research chemists tend to regard themselves as highly inventive. They discover useful compounds where no such compounds previously existed. Some chemical engineers, on the other hand, tend to think of their work as more socially worthwhile. Without their efforts, new compounds would remain forever as nothing more than curiosities sitting on a laboratory shelf.

Despite such mutual bantering, the work of chemists and chemical engineers is, in reality, interdependent. Without the chemists, chemical engineers would have no need to design and operate new plants to make new compounds. Without the chemical engineers, the work of the chemists never would be commercialized, and potential users never would have access to them.

Dunn of the University of Michigan comments, "A healthy rivalry has long existed between chemists and chemical engineers. Each group, of course, has a certain ego. But the two groups generally work well together, despite their competitiveness and good-natured kidding. Indeed, I would describe the relationship of the two groups as a clear case of symbiosis." □

Weak economy tightens the screws on this year's job market for chemists and chemical engineers

Demand

In a year of severe recession, it is not surprising that the demand for chemists and chemical engineers is noticeably less than in 1981. This decline has been evident from a variety of indicators.

For example, the volume of classified advertising in C&EN for new employees so far this year is decidedly less than in the comparable period of 1981. And recruiting activity at ACS's National Employment Clearing House in Kansas City last month was unusually slow.

Last year, some universities reported that recruiting activity for graduating chemists was good, whereas at other schools it was considerably less than the previous year. This year, on the other hand, almost all schools contacted indicate that job opportunities for their graduating chemists are disappointing. Some schools said that a few 1982 graduates still have not found employment.

Rebecca J. Simon, placement director for the University of Illinois' school of chemical sciences at Urbana, reports that the number of job offers made to graduating chemists and chemical engineers at all degree levels in academic year 1981–82 was about half of what it had been in recent years. A few employers withdrew interview invitations they had made to graduating students, and, in two or three cases, employers actually retracted job offers to students.

Simon also points out that employers originally scheduled an unusually large number of recruiting visits in 1981–82 (270 visits, compared to 253 in the previous academic year). However, employers later canceled many visits (48 in 1981–82, compared to 26 in the previous year). As a result, the number of visits actually made was 222 in 1981–82, compared to 227 in 1980–81. Most of the visits canceled at Urbana in 1981–82 were during the spring recruiting season. "Many companies," Simon comments, "felt they had seen enough students to fill their needs as a result of interviews conducted in the fall."

Simon also says that a larger number of employers than usual have canceled their fall recruiting visits this year. Some companies that normally recruit more than once during the school year, she notes, are making fewer visits. Most recruiters have fewer jobs to fill than in past years. However, if the economy picks up in the coming months, recruiting in spring 1983, she believes, may improve noticeably.

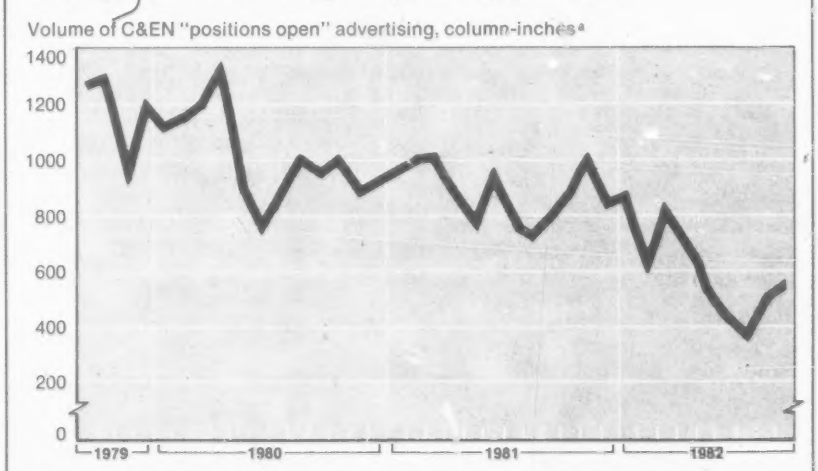
At the University of Wisconsin, the number of employers who recruited graduating chemists on the campus decreased slightly from 78 in 1980–81 to 76 in 1981–82. Recruiters mainly were from companies in the chemical, petroleum, and pharmaceutical industries.

Audrey L. Aylesworth, chemistry placement coordinator at Wisconsin, finds that many employers visiting in 1981–82 were uncertain about the number of chemists they wanted to hire. Some recruiters clearly have no specific openings in mind but merely are interviewing students on the possibility that an unexpected opening might occur.

At the University of Wisconsin, B.S. chemistry graduates received an average of 1.0 job offer in 1981–82, compared to 1.2 offers in the previous academic year. On the other hand, the demand for Ph.D. chemistry graduates improved to an average of 3.1 job offers in 1981–82, compared to 2.6 in 1980–81.

Aylesworth expects about the same number of employers to interview the

Recruitment advertising drops sharply in 1982



a Total volume of "positions open" advertising in four consecutive issues of C&EN. No issues were published in the last week of December 1979, 1980, and 1981.

Hiring of chemical professionals is declining, C&EN survey indicates

Employers are hiring markedly fewer chemists and chemical engineers in 1982 than they did in 1981. They expect to hire even fewer in 1983. In brief, the employment outlook for chemical professionals this year and next, according to a recent C&EN survey, is far from encouraging.

Most employers responding to the survey believe, however, that the employment outlook for chemists and chemical engineers over the next five years is good to excellent. Nevertheless, they are not so optimistic this year as they were a year ago.

This year, 8% of the respondents say the employment outlook for chemists in their organizations is excellent, 23% think it is very good, and 50% call it good. On the other hand, last year the corresponding results were 3% excellent, 58% very good, 33% good.

As for chemical engineers, 4% of the responding organizations this year say that the employment outlook in their organizations over the next five years is excellent, 46% call it very good, and 29% consider it good. In contrast, last year's results were 34% excellent, 21% very good, and 31% good.

The C&EN survey of the hiring activity and plans of leading U.S. employers of chemists and chemical engineers covered 27 organizations, including some of the nation's largest chemical companies as well as a few research institutes. Most are in the chemical industry, although some are in such related fields as petroleum, rubber, metals, and pharmaceuticals. They currently employ about 13,000 chemists and 16,000 chemical engineers.

Between mid-1981 and mid-1982, the number of chemists on the staffs of these organizations declined 1%, but the number of their chemical engineers increased 3%. Between mid-1982 and mid-1983, they expect the numbers of their chemists and chemical engineers to decrease 1%.

Respondents say they are hiring 39% fewer chemists this year than in 1981. And they plan to hire 11% fewer chemists in 1983 than in 1982. They also are hiring 36% fewer chemical engineers in 1982 than last year and expect to hire 33% fewer in 1983 than in 1982.

Most of this hiring will be from recent college graduates. For chemists, the proportion of new employees who were new graduates was 69% in 1981 and 74% in 1982 and is expected to be 77% in 1983. For chemical engineers, the figures were 80% in 1981 and 86% in 1982 and is expected to be 82% in 1983.

The current recession has caused a marked reduction in the number of college recruiting visits by employers looking for chemists and chemical engineers. In their search for chemists, employers made 9% fewer visits to college campuses in academic year 1981–82 than in 1980–81. They expect to make 28% fewer visits in 1982–83 than in 1981–82. To recruit chemical engineers, they made 9% fewer campus visits in 1981–82 than in the previous year. They plan to make 34% fewer such visits in 1982–83 than in the previous year.

The C&EN survey asked employers how the recession has affected their hiring of chemists in the past 12 months. For 46%, it has affected their hiring of chemists greatly. For 42%, it has had a moderate effect, but for 12% little or none.

Asked for general comments on the effects of the current business decline on their hiring of chemists, organizations gave such replies as: "Our reduced hiring of chemists reflects the general slowdown in the economy." "At present, we are not hiring any new personnel." "The current poor economic climate will significantly affect job opportunities for chemists because of major reductions in our R&D programs and our lower production levels." "Hiring here has come to a virtual standstill." "Until business conditions improve substantially, we will hire only replacements for employees who retire or resign."

Employers also were asked when they thought job prospects for chemists would get better because of an improvement in business conditions. Fully 40% of the respondents said that job prospects would improve in the second quarter of 1983, 27% said the third quarter, and 20% said the fourth quarter, but 13% see no improvement before 1984.

As was true last year, the three types of chemical specialists in greatest demand by employers this year are analytical chemists, organic chemists, and polymer chemists. Employers also expressed a special interest in biochemists, physical chemists, inorganic chemists, nuclear chemists, and organometallic chemists.

The C&EN survey also indicates that the percentage of chemists who are women seems to have leveled off. It was 12% in 1981 and 1982 and is expected to remain 12% in 1983. On the other hand, the percentage of chemical engineers who are women is expected to increase slightly next year. It was 7% in 1981 and 1982 and is predicted to rise to 8% in 1983.

school's graduating chemists in 1982–83 as did so in the previous year. But she is uncertain about how many job openings these employers will have. "On that question," she says, "we are holding our breath, particularly since we have heard that some employers have laid off some of their young chemists in recent months."

At Ohio State University, the slowdown in demand for graduating chemists began about January of this year. "The optimism we felt in September 1981," says Jean E. Eisel, director of career services for Ohio State's Colleges of Arts and Sciences, "was replaced by pessimism at about the start of 1982. A few of our well-qualified Ph.D. chemistry graduates are still looking for jobs in their fields."

Because of the difficult job situation, she notes, students have become decidedly less selective. Many companies indicate that more often than usual graduating chemists accepted job offers almost immediately. Eisel adds, "I think the employment situation for graduating chemists and other professionals will be even worse in 1982–83 than in 1981–82."

Demand for chemical engineering graduates at the University of Maryland was high in the fall of 1981 but declined sharply in early 1982, according to Theodore W. Cadman, chairman of the department of chemical and nuclear engineering. Companies apparently met their quotas for new chemical engineers in the final months of 1981 and then called off most of their recruiting interviews scheduled for early 1982. In some cases, definite offers to students were canceled abruptly, particularly if the student was slow to accept the offer.

Despite all the pessimism about the job market for chemical professionals, a survey by the American Chemical Society of its chemist members shows that only 1.5% were unemployed but seeking employment last March. This was only slightly higher than the unemployment rate of 1.1% in March 1981 and 0.9% in March 1980 (the lowest level since ACS began con-

Bachelor's degrees decline for chemists but reach new high for chemical engineers

Academic year	Degrees awarded in chemistry[a]			Degrees awarded in chemical engineering		
	Bachelors	Masters	Ph.D.s	Bachelors	Masters	Ph.D.s
1970–71	11,183	2284	2160	3615	1100	406
1971–72	10,721	2259	1971	3663	1154	394
1972–73	10,226	2230	1882	3636	1051	397
1973–74	10,525	2138	1828	3454	1045	400
1974–75	10,649	2006	1824	3142	990	346
1975–76	11,107	1796	1623	3203	1031	308
1976–77	11,322	1775	1571	3581	1086	291
1977–78	11,474	1892	1525	4615	1237	259
1978–79	11,643	1765	1518	5655	1149	304
1979–80	11,446	1733	1551	6383	1271	284
1980–81	11,347	1654	1622	6527	1267	300

a Does not include biochemistry and geochemistry. **Source:** Department of Education's National Center for Education Statistics

ducting employment surveys in 1971). The highest level of unemployment among ACS-member chemists was 3.2% in March 1972.

Unemployment among chemists remains markedly less than in the total U.S. labor force. According to the Bureau of Labor Statistics, that figure was 9.0% in March 1982 and climbed to 9.8% in August and to 10.1% in September. The unemployment rate for professional and technical employees, although much lower than that for the total U.S. labor force, also is on the upswing. It has risen from 2.7% in March 1981 to 3.2% in September of this year.

The highest unemployment rate for ACS-member chemists in March 1982 was among those with B.S. degrees, 2.2% of whom were unemployed but seeking employment, compared to 1.4% of those with M.S. degrees and 1.3% of those with Ph.D.s.

Typically, women chemists have a higher rate of joblessness than their male counterparts. In March 1982, 2.8% of ACS-member women chemists were unemployed but seeking employment, contrasted with 1.3% of male members. In March 1981, the comparable figures were 2.4% for women and 0.9% for men.

Final data on the unemployment rate among members of the American Institute of Chemical Engineers in early 1982 are not expected to be available until November. The preliminary estimate, however, is that, as of March 1982, 0.9% of AIChE members were out of work. This figure compares with 0.5% in early 1981 and 0.4% in early 1978, 1979, and 1980.

The falloff in the demand for chemical professionals is reflected clearly in the decreased volume of "positions open" advertising in C&EN. In its first 40 issues of 1982, C&EN published 6290 column-inches of such advertising—down 30% from 8962 column-inches in the first 40 issues of 1981 and down 41% from the 10,663 column-inches in the first 40 issues of 1980.

Another indication of lower demand for chemists and chemical engineers is activity at the National Employment Clearing House at ACS's fall 1982 national meeting in Kansas City, Mo., compared to the society's fall 1981 national meeting in New York City and the fall 1980 meeting in Las Vegas.

In Kansas City, only 112 employers used the clearinghouse, down from 300 in New York and 209 in Las Vegas. Job applicants totaled 468 in Kansas City, 697 in New York, and 356 in Las Vegas. But the number of positions listed for candidates' review dropped to 170 in Kansas City from 484 in New York and 375 in Las Vegas and the total number of job interviews was only 898 in Kansas City, compared to 2336 in New York and 1165 in Las Vegas.

Each job candidate averaged 1.9 interviews in Kansas City, fewer than the 3.4 in New York and 3.3 in Las Vegas. The average number of interviews at Kansas City not only was lower than for the fall ACS national meetings in the past several years but was also less than the 2.3 interviews per candidate at the fall meeting in Chicago in the recession year 1975.

According to Audra B. Rafter, manager of the ACS Employment Aids Office, the largest number of positions listed at the Kansas City clearinghouse was for analytical chemists (32 openings) and organic chemists (also 32). The runnersup were physical chemists (13 openings), biochemists (11), chemical engineers (11), and polymer chemists (nine). In contrast, at last year's national meeting in New York, there were 110 positions listed for analytical chemists, 74 for organic chemists, and 64 for polymer chemists. Of course, the New York area is a much larger center of chemical activity than is the Kansas City area.

Data from the College Placement Council in Bethlehem, Pa., based on reports from 161 colleges and universities, indicate that markedly fewer job offers were made to graduating students in the 12 months ending July 1982 than in the previous 12 months. Candidates for B.S. degrees in chemistry received 36% fewer offers, inexperienced candidates for M.S. degrees in chemistry received 52% fewer offers, and Ph.D. candidates in chemistry got 33% fewer offers.

The job situation was disappointing also for chemical engineers. B.S. chemical engineering students received 46% fewer job offers in 1981–82 than in 1980–81. Inexperienced M.S. candidates got 58% fewer offers, and Ph.D. candidates likewise got 58% fewer offers.

The availability of chemists is influenced greatly by the number who graduate each year. According to the Department of Education's National Center for Education Statistics, B.S. degrees awarded in chemistry declined from 11,446 in academic year 1979–80 to 11,347 in 1980–81. B.S. degrees in chemistry previously had increased every year from 1973–74 through 1978–79. On the other hand, the number of Ph.D. degrees awarded in chemistry rose from 1551 in 1979–80 to 1622 in 1980–81 after having declined every year from 1970–71 through 1978–79.

Particularly impressive has been the increase in B.S. degrees awarded in chemical engineering. It has risen 81% from 3615 in 1970–71 to 6527 in 1980–81. Much of this gain has taken place since 1976–77.

Also noteworthy has been the rise in the number of Ph.D. degrees awarded in chemical engineering from 259 in 1977–78 to 300 in 1980–81—a gain of 16%. The latest available figure is still considerably lower, however, than the 406 Ph.D. degrees in chemical engineering awarded in 1970–71. Whether a tendency for more chemical engineers to obtain a Ph.D. degree is developing has yet to be determined. □

Recession and inflation combine to crimp salaries this year for both experienced and inexperienced chemists

Salaries

The long arm of business recession is having an impact on salaries of chemists, as well as on demand. The effect, moreover, is evident most clearly for chemists with no more than a bachelor's degree.

The median salary paid to all experienced chemists with a B.S. degree was up a mere 4% during the 12-month period ending last March. That's the smallest year-to-year gain in their earnings in the past six years. Annual salaries for chemists with higher degrees fared slightly better, but not much. The median for chemists with an M.S. climbed 5% and that for chemists with a Ph.D. was 7% higher between March 1981 and March 1982.

Even more unusual, however, is the 1% decline in the median starting salary for B.S. chemists that shows up this year. Not since the early 1970s have starting salaries dropped from the year before for chemists at any degree level. On the other hand, median starting salaries are up a healthy 12% in 1982 for inexperienced chemists with an M.S. and 10% for those who have earned a Ph.D.

These are some of the findings of two annual salary surveys carried out by the ACS Office of Manpower Studies. One survey, made last March (C&EN, July 5, page 22), deals with salaries of experienced chemists and chemical engineers who are ACS members. The other provides data on the salaries of inexperienced chemistry and chemical engineering graduates (those with 12 months or less of professional experience), many of whom are not ACS members. Results of this survey will be reported in November as Starting Salaries 1982.

The survey of experienced chemists and chemical engineers, based on responses from more than 12,000 ACS members, shows that the median annual salary of B.S. chemists increased from $27,500 on March 1, 1981, to $28,500 on March 1, 1982; the median annual salary of M.S. chemists rose from $30,000 to $31,600; and the median for Ph.D. chemists increased from $35,000 to $37,500.

The survey also found that the median annual salary of experienced B.S. chemical engineers who belong to ACS climbed 11% from $36,000 on March 1, 1981, to $40,000 on March 1, 1982; the median for M.S. chemical engineers rose 5% from $40,000 to $42,000; and that for Ph.D. chemical engineers rose 7% from $42,000 to $45,000.

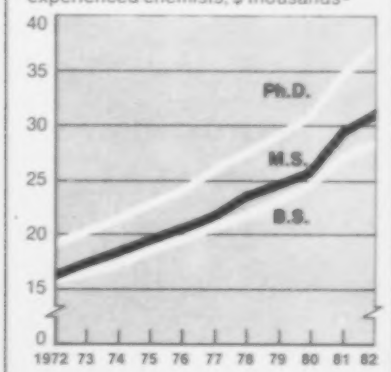
For chemical engineers covering all degree levels, the median annual salary increased 7% from $39,200 to $42,000, 21% greater than that of chemists.

The American Institute of Chemical Engineers tentatively reports that the median annual salary of its members (covering all degree levels) rose 15% from $34,000 in February 1981 to $39,000 in March 1982. As in the past, the median annual salary of AIChE members is lower than that of chemical engineers who belong to ACS. Members of AIChE, for one thing, on the average are younger and have less professional experience than ACS-member chemical engineers and are less likely to hold high-paying jobs in management.

Although between March 1981 and March 1982 the median salaries of chemists increased, no matter what degree they have, these gains evaporated as a result of inflation. Consumer prices, as measured by the Bureau of Labor Statistics, rose 7% during this period. Hence, the median salary of B.S. chemists in constant dollars declined 3% and that of M.S. chemists fell 1%, whereas the median for Ph.D. chemists remained, in effect, unchanged.

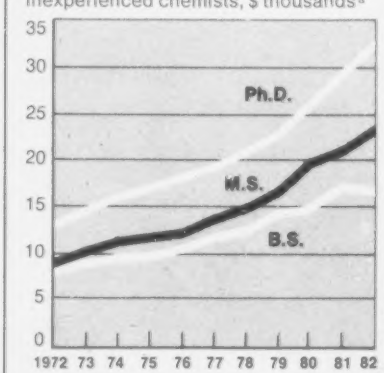
Chemists' salaries are influenced

Chemists' salaries rose more slowly in 1982



a Chemists with more than 12 months of professional experience; data as of March of each year.
Source: ACS comprehensive salary survey

Starting salaries decline slightly for B.S. chemists



a Chemists with 12 months or less of professional experience; data as of about June of each year.
Source: ACS starting salary surveys

by a variety of factors, including the type of employer they work for. Ph.D. chemists, for example, receive a median annual salary of $42,000 if they work in industry, $40,000 in government, and $30,000 in colleges and universities.

In March 1982, the median annual salary of B.S. chemists in industry was $30,600 for men and $23,000 for women. For M.S. chemists in industry, it was $35,000 for men and $27,350 for women. And for industrial Ph.D. chemists, it was $42,840 for men and $34,440 for women. Women chemists tend to earn less than men chemists in part because they are, on the average, younger and less experienced than men chemists. The median age of employed women belonging to ACS is 37, whereas it is 42 for men.

The 1982 ACS starting salary survey, which is reported here for the first time, is based on replies from 4436 inexperienced chemists and chemical engineers. It indicates that the median annual starting salary of B.S. chemists working full time is $17,000 this year, compared to $17,200 last year.

The median annual starting salary of M.S. chemists in 1982 rose to $23,880, from $21,300 in 1981. For Ph.D. chemists, it climbed to $32,400 from $29,500 in 1981.

As is typical, starting salaries of inexperienced chemical engineers surpass those of chemists. The median for B.S. chemical engineers working full time rose 9% from $24,400 in 1981 to $26,500 in 1982. The median for M.S. chemical engineers rose from $26,000 in 1981 to $28,800 in 1982, and for Ph.D. chemical engineers it increased from $31,500 to $35,000—a gain of 11% for both groups.

The medians for inexperienced full-time B.S. chemists in 1982 are $19,000 in manufacturing industry, $16,250 in nonmanufacturing industry, $14,840 in federal, state, and local governments, and $12,000 in colleges and universities. For full-time B.S. chemical engineers, the median starting salaries are $27,000 for those employed in manufacturing industry, $26,000 for those in nonmanufacturing industry, $19,930 for those in federal, state, and local governments, and $18,750 for those in colleges and universities.

In the past few years, median starting salaries of B.S. women chemists and chemical engineers in manufacturing industry either have exceeded those of their male counterparts or were similar. Earlier, the starting salaries of B.S. women chemists and chemical engineers were noticeably below those of men. This year, the median starting salary of B.S. women chemists is $18,920, whereas the median for comparable men is $19,000. In 1981, the median for B.S. women chemists was $19,000 and the median for men $18,000.

The median starting salary for B.S. chemical engineers who are women is $26,750 this year; for men it is $27,000. Last year, B.S. women chemical engineers received a median starting salary of $24,650, compared to $24,500 for B.S. men chemical engineers.

According to the ACS survey, 23% of inexperienced B.S. chemists are working full time in the chemical profession this year. Of the remainder, 26% have graduate assistantships or fellowships, 9% are employed full time in nonchemical jobs, 29% are unemployed but not seeking employment, and 13% are unemployed but seeking employment. Last year, only 10% of new B.S. chemists were unemployed but looking for a job.

Among inexperienced Ph.D. chemists in 1982, 63% are employed full time in the chemical profession, 31% have postdoctoral fellowships, 3% are doing nonchemical work, 1% are unemployed but not seeking employment, and 2% are unemployed but seeking employment. Last year, 1% of the new Ph.D. chemists were unemployed but in the job market.

The employment situation for Ph.D. chemists is appreciably better now than it was in the mid-1970s. In 1976, for example, only 44% of inexperienced Ph.D. chemists were employed full time in the chemical field. In addition, 49% of new Ph.D.s that year were doing postdoctoral work—in many cases, not because they wanted to but because they could not obtain other work. The proportion of new Ph.D. chemists doing postdoctoral work was as low as 24% in 1979.

Among new B.S. chemical engineers, 53% now are working full time in the chemical field, 9% have graduate assistantships or fellowships, 11% are employed full time in nonchemical work, 5% are unemployed but not seeking employment, and a sizable 23% are unemployed and seeking work. Only 7% of inexperienced B.S. chemical engineers were unemployed and seeking employment last year.

New Ph.D. chemical engineers have fared much better this year than those with B.S. degrees; 93% are employed full time in the chemical profession. Of the remainder, 4% are doing postdoctoral work, 2% are in nonchemical work, and 2% are unemployed but searching for a job. □

Salaries paid to professionals are difficult to compare

It is difficult to compare salaries earned by chemists with the salaries paid to other professionals. Strictly comparable data are not available for many types of work. Nevertheless, several organizations do compile salary information that provides a rough indication of what people earn in various fields.

The American Medical Association, for example, reports that the average net income (gross income, less expenses) of U.S. physicians from their medical practice in 1981 was $93,000. The American Dental Association estimates that the average net income of dentists from professional practice in 1981 was about $55,000. The American Institute of Physics says that the average salary of the Ph.D. members of the nine societies that constitute AIP (most of whose members are physicists and about 75% of whom are Ph.D.s) was $37,100 in May 1981.

Each year, the Department of Labor's Bureau of Labor Statistics gathers data on the salaries of employees in a number of white-collar occupations in private industry. BLS collects the information primarily to determine whether the salaries that the government pays its employees are competitive with those paid by industry. The findings permit general comparisons to be made between the salaries offered by industry to workers in various professions at different job levels.

	Average annual salary[a]
Attorneys, upper level	$76,202
Engineers, upper level	62,494
Chief accountants, upper level	61,255
Personnel directors, upper level	57,859
Chemists, upper level	53,658
Accountants, upper level	48,549
Chief accountants, starting	34,506
Engineers, middle level	34,443
Chemists, middle level	34,047
Personnel directors, starting	31,136
Attorneys, starting	25,162
Engineers, starting	23,622
Chemists, starting	19,640
Accountants, starting	18,260

a As of March 1982, excluding overtime and nonproduction bonuses, but including cost-of-living bonuses and incentive earnings. Source: Department of Labor's Bureau of Labor Statistics

BEST AVAILABLE COPY

Career Planning

Career Planning is designed to acquaint both the student and the experienced graduate with services, sources of information, and organizations that can supply guidance in selecting, obtaining, and changing careers. The directory included at the end of this section is a guide to U.S. organizations that employ significant numbers of chemists and chemical engineers. It is, of course, not all-inclusive. The directories listed under General Information include the names of other organizations that employ chemists and chemical engineers. Inquiries about career opportunities in specific organizations should be adressed directly to the organization, in care of the personnel director.

GENERAL INFORMATION

American Chemical Society: Chemical & Engineering News salary surveys, employment surveys, and classified ads (see also ACS Information below), 1155—16th St., N.W., Washington, D.C. 20036.

Directories: "American Council of Independent Laboratories Directory, 1982," 1725 K St., N.W., Washington, D.C. 20006; "Association of Consulting Chemists & Chemical Engineers Council Directory," 21st edition, 1982, 50 East 41st St., New York, N.Y. 10017; "College Placement Annual, 1983," College Placement Council, P.O. Box 2263, Bethlehem, Pa. 18801; "American Consulting Engineers Council Membership Directory, 1982–83," 1155—15th St., N.W., Washington, D.C. 20005; "Directory of Chemical Producers, 1982," SRI International, Menlo Park, Calif. 94025; "Industrial Research Laboratories of the United States," 17th edition, 1982, R. R. Bowker Co., 1180 Ave. of the Americas, New York, N.Y. 10036; "Research Centers Directory," 7th edition, 1982, Gale Research Co., Book Tower, Detroit, Mich. 48226.

Scientific Manpower Commission: "Science and Engineering Careers—A Bibliography," April 1974, $2.00; "Salaries of Scientists, Engineers, and Technicians," 10th edition, November 1981, $25; "Professional Women and Minorities—A Manpower Data Resource Service." 3rd edition, April 1982, $60; "Supply and Demand for Scientists and Engineers," 2nd edition, January 1982, $25; "Manpower Planning for Scientists and Engineers," May 1977, $2.00; *Scientific, Engineering, Technical Manpower Comments*, 10 issues a year, $30 for one year, $55 for two years. All available from 1776 Massachusetts Ave., N.W., Washington, D.C. 20036.

Scientific and professional societies: American Institute of Chemists, 7315 Wisconsin Ave., N.W., Washington, D.C. 20014; American Institute of Chemical Engineers, 345 East 47th St., New York, N.Y. 10017; and National Society of Professional Engineers, 2029 K St., N.W., Washington, D.C. 20006. They offer information on their specific programs for career guidance.

Sources of information about prospective employers: Available in many public libraries, "Moody's Industrial Manual," "Dun & Bradstreet," "Thomas Register of American Manufacturers," and "Standard and Poor's Register."

U.S. Department of Labor: Occupational Outlook Handbook, 1982–83 edition, Bulletin 2200, $13 per hardback copy and $9.00 per paperback copy. Order from Bureau of Labor Statistics, 1515 Broadway, New York, N.Y. 10036, or other office of the bureau.

Vocational guidance manuals: "Opportunities in Chemistry" by John H. Woodburn, 1979; "Opportunities in Engineering Technology" by John E. Heer Jr. and D. Joseph Hagerty, 1979; "Opportunities in Materials Science" by Charles Wert, 1978; "Opportunities in Energy Careers" by John H. Woodburn, 1979; "Opportunities in Environmental Careers" by Odom Fanning, 1981; "Opportunities in Chemical Engineering" by D. Joseph Hagerty, Earl R. Gerhard, and Charles A. Plank, 1979; and "Women in Science" by Alice Fins, 1979. Available from VGM Career Horizons, a division of National Textbook Co., 8259 Niles Center Rd., Skokie, Ill. 60077. "Peterson's Guide to Engineering, Science, and Computer Jobs," 1982 edition. Available from Peterson's Guides, P.O. Box 2123, Princeton, N.J. 08540.

ACS INFORMATION

Education aids for high school students: Careers in Chemistry: Questions and Answers," "List of ACS Approved Schools," "A Career in Chemical Engineering," "A Career in Analytical Chemistry," "A Career as a Chemical Technician," and "Financial Aids for College Students." All single copies free from ACS Education Marketing Office.

Education aids for college students: "College Chemistry Seniors," a listing of résumés submitted by seniors majoring in chemistry and chemical engineering who plan to enter graduate school, 1982–83 edition, $98; "Directory of Graduate Research," a listing of master's and Ph.D. degree-granting departments of chemistry, chemical engineering, biochemistry, and pharmaceutical/medicinal chemistry in the U.S. and Canada, with names of faculty members, their research interests, and bibliographies of their recent publications, 1981 edition, $37; and "College Chemistry Faculties," a listing of two- and four-year college and university teachers of chemistry, chemical engineering, and biochemistry in the U.S., Canada, and Mexico, 5th edition (1980), $25. All available from ACS Distribution Office. "Graduate School Information Aids," "Careers Nontraditional," "Career Options," "I Know You're a Chemist, But What Do You Do?," "Graduate Programs," and "Futures Through Chemistry: Charting a Course" are available from ACS Education Marketing Office, single copies free. *Journal of Chemical Education*, a monthly publication of the ACS Division of Chemical Education, $17 per year for regular domestic individual subscribers and $12.75 per year for domestic students. Available from *Journal of Chemical Education*, Subscription Fulfillment Department, 20th & Northampton St., Easton, Pa. 18042.

Information for foreign students: "Guide to Chemical Education in the U.S. for Foreign Students" (paperback, 106 pages) recommends the eduational backgrounds students should have to study chemistry in the U.S. It discusses prerequisites that must be met in chemistry, physics,

and mathematics and indicates typical course contents, textbooks in wide use, and representative examinations that students should be able to pass at different stages in work toward B.S., M.S., and Ph.D. degrees. Single copies are $7.50, and discounts are offered for bulk orders. Available from ACS Distribution Office.

Continuing education aids: ACS Short Courses are live, intensive, up-to-date courses in chemistry offered publicly year round, also available to organizations on an in-house basis; ACS Audio Courses, taped up-to-date courses by recognized authorities; ACS Video Courses, chemistry lectures on videotape; and ACS Computer Courses, highly interactive educational programs for chemists developed by experts for presentation on microcomputers. All available from ACS Education Division.

Employment information: ACS publishes several annual volumes of statistical data about the chemical profession and the salaries paid to its members: "Salaries 1982," the results of a salary survey of the ACS membership, 97 pages, $45; "Professionals in Chemistry 1979–1980," a statistical yearbook, 51 pages, $22; "Starting Salaries 1981," the results of a survey of new graduates in chemistry and chemical engineering, 75 pages, $10 (the 1982 edition will be available in early November for $10); and "Women Chemists 1980," a report on women chemists' salaries and employment, 140 pages, $10. All from ACS Distribution Office.

The 1978 edition of "Professional Employment Guidelines" is free; send stamped, self-addressed, business-size envelope. "Chemistry: A Job or a Career?" consists of a 30-minute cassette tape, booklets, and a slide presentation that are offered free to student affiliate chapters and to chemistry and chemical engineering departments. Available from ACS Department of Professional Relations & Manpower Studies.

Salary information in C&EN: Starting salaries in 1982, see page 50. Comprehensive salary survey in 1982, C&EN, July 5, page 22.

ACS EMPLOYMENT AIDS

Employment Clearing House: ACS members and student affiliates can file applications in the Washington office at no charge. Employers may write or call the Washington office to receive copies of résumés of applicants who possess specified qualifications for positions. The service is year-round and nonconfidential.

Confidential Employment Listing: This service enables employed ACS members who are seeking a new position to have their records on file at the ACS Employment Aids Office and to have them made available to all but specified employers, such as their present employer. This listing enables experienced candidates who otherwise would not wish to have their records circulated on a nonrestricted basis to let all but specified employers know of their desire to find a new position. Because of the added cost of handling such confidential records, ACS members are charged $25 for a year's listing.

Employment Clearing House, National Meetings: The society helps ACS members and employers to arrange on-the-spot interviews at ACS national meetings. This free, nonconfidential service is open to those registered and in attendance at the meeting. Unemployed members who want to use the national Employment Clearing House may have meeting registration fees waived on request.

Academic Openings: This publication lists positions, including postdoctoral positions, available at colleges and universities. It is published on a monthly basis if enough notices are received from academic institutions. The 20th of any month is the deadline for publication. If too few listings are received, publication is held over until the next month. This service is provided for all those interested in academic employment. Subscriptions to Academic Openings are $12 a year and can be obtained by writing to the ACS Employment Aids Office.

C&EN employment advertising section: Student affiliates and employed ACS members receive discounts from regular advertising rates. ACS members who are unemployed or are under notice of involuntary unemployment within 60 days may place one free classified "situations wanted" advertisement that will appear in every other issue for a period of six months—a total of 13 insertions a year. Student members or student affiliates who have not gained employment two months before graduation are entitled to the same privileges. Retired members are entitled to six free nondisplay advertisements a year. See the Employment Ads Information box at the start of the C&EN employment advertising section in any current issue for instructions.

Résumé service: An unemployed member may obtain free up to 50 printed copies of his or her résumé, limited to two pages typed in reproducible form. Write ACS Employment Aids Office.

ACS local sections: Some ACS local sections provide job assistance. Contact the secretary of the local section.

For ACS information listed in this section, write to American Chemical Society, 1155—16th St., N.W., Washington, D.C. 20036.

OTHER EMPLOYMENT SERVICES

Classified listings: *Chemical & Engineering News*, weekly newsmagazine of the American Chemical Society; *Chemical Engineering Progress*, monthly magazine of the American Institute of Chemical Engineers; *The Chemist*, monthly publication of the American Institute of Chemists; *Science*, weekly magazine of the American Association for the Advancement of Science; and classified sections of newspapers.

College placement bureaus: Campus placement offices usually maintain a file of openings for graduating students and recent graduates. They frequently arrange interviews between students and employers.

Private placement agencies: Check those in your area to determine what services are offered. They differ in quality, cost, and nature of service.

ORGANIZATIONS FOR WOMEN

American Association for the Advancement of Science: Project on Women in Science, Office of Opportunities in Science, AAAS, 1776 Massachusetts Ave., N.W., Washington, D.C. 20036.

American Association of University Professors: Committee on Status of Women in the Profession, AAUP, 1 Dupont Circle, N.W., Washington, D.C. 20036.

American Chemical Society: Women Chemists Committee, Maureen G. Chan, Room 7F-208, Bell Laboratories, 600 Mountain Ave., Murray Hill, N.J. 07974.

American Society of Biological Chemists: Committee on Equal Opportunities for Women, Elizabeth Anderson, ASBC, 9650 Rockville Pike, Bethesda, Md. 20014.

Association for Women in Science: Room 1122, 1346 Connecticut Ave., N.W., Washington, D.C. 20036.

Society of Women Engineers: Mary Lou Barnas, Executive Secretary, Room 305, 345 East 47th St., New York, N.Y. 10017.

The following list includes most of the nation's major employers of chemists and/or chemical engineers. The organizations did not ask to be included in this directory and are not necessarily hiring chemists or chemical engineers at this time.

Chemicals

Aceto Chemical Co., 126-02 Northern Blvd., Flushing, N.Y. 11368

Airco, 85 Chestnut Ridge Rd., Montvale, N.J. 07645 (subsidiary of BOC International Ltd. of the U.K.)

Air Products & Chemicals, P.O. Box 538, Allentown, Pa. 18105

Akzona, P.O. Box 2930, Asheville, N.C. 28802 (affiliated with Akzo N.V. of the Netherlands)

Alcolac, 3440 Fairfield Rd., Baltimore, Md. 21226

Aldrich Chemical Co., 940 West St. Paul Ave., Milwaukee, Wis. 53233

Allied Chemical Co., P.O. Box 1087R, Morristown, N.J. 07960 (division of Allied Corp.)

American Color & Chemical Corp., P.O. Box 32516, Charlotte, N.C. 28232 (subsidiary of North American Philips Corp. and Koppers Co.)

American Cyanamid Co., 1 Cyanamid Plaza, Wayne, N.J. 07470

American Enka Co., Enka, N.C. 28728 (division of Akzona)

American Hoechst Corp., Rte. 202-206 North, Somerville, N.J. 08876 (owned by Hoechst A.G. of West Germany)

American Hoechst Corp., industrial chemicals division, P.O. Box 268, Coventry, R.I. 02816

Amoco Chemicals Corp., 200 East Randolph Dr., Chicago, Ill. 60601 [subsidiary of Standard Oil Co. (Ind.)]

Ansul Co., 1 Stanton St., Marinette, Wis. 54143 (subsidiary of Wormald International of Australia)

Apex Chemical Corp., 200 South First St., Elizabethport, N.J. 07206

Arco Chemical Co., 1500 Market St., Philadelphia, Pa. 19101 (division of Atlantic Richfield Co.)

Arizona Chemical Co., 16-00 Rte. 208, Fair Lawn, N.J. 07410 (jointly owned by American Cyanamid Co. and International Paper Co.)

Armak Co., 300 South Wacker Dr., Chicago, Ill. 60606 (subsidiary of Akzona)

Ashland Chemical Co., P.O. Box 2219, Columbus, Ohio 43216 (subsidiary of Ashland Oil)

AZS Corp., P.O. Box 93366, Atlanta, Ga. 30318 (subsidiary of Toyo Soda Mfg. Co. of Japan)

Badische Corp., Williamsburg, Va. 23185 (subsidiary of BASF A.G. of West Germany)

J. T. Baker Chemical Co., 600 North Broad St., Phillipsburg, N.J. 08865 (subsidiary of Richardson-Vicks)

BASF Wyandotte Corp., 100 Cherry Hill Rd., Parsippany, N.J. 07054 (owned by BASF A.G. of West Germany)

Beaunit Corp., 261 Madison Ave., New York, N.Y. 10016 (subsidiary of El Paso Natural Gas Co.)

Betz Laboratories, 4636 Somerton Rd., Trevose, Pa. 19047

Big Three Industries, P.O. Box 3047, Houston, Tex. 77001

Borden Chemical, 180 East Broad St., Columbus, Ohio 43215 (division of Borden)

Borg-Warner Corp., 200 South Michigan Ave., Chicago, Ill. 60604

Buckman Laboratories, 1256 North McLean Blvd., Memphis, Tenn. 38108

Cabot Corp., 125 High St., Boston, Mass. 02110

Calbiochem-Behring Corp., 10933 North Torrey Pines Rd., La Jolla, Calif. 92037 (subsidiary of American Hoechst Corp.)

Calgon Corp., P.O. Box 1346, Pittsburgh, Pa. 15230 (subsidiary of Merck & Co.)

Callery Chemical Co., Callery, Pa. 16024 (division of Mine Safety Appliances Co.)

Carus Corp., 1500 Eighth St., La Salle, Ill. 61301

Celanese Corp., 1211 Ave. of the Americas, New York, N.Y. 10036

CF Industries, Salem Lake Dr., Long Grove, Ill. 60047

Chemed Corp., 1200 DuBois Tower, Cincinnati, Ohio 45202

Chemplex Co., 3100 Gold Rd., Rolling Meadows, Ill. 60008 (jointly owned by American Can Co. and Getty Oil Co.)

Chemtech Industries, 1655 Des Peres Rd., St. Louis, Mo. 63131

Chevron Chemical Co., 575 Market St., San Francisco, Calif. 94105 (subsidiary of Standard Oil Co. of California)

Ciba-Geigy Corp., Saw Mill River Rd., Ardsley, N.Y. 10502 (owned by Ciba-Geigy A.G. of Switzerland)

Clorox Co., 1221 Broadway, Oakland, Calif. 94612 (owned 23% by Henkel KGaA of West Germany)

Columbia Nitrogen Corp., P.O. Box 1483, Augusta, Ga. 30913 (owned by DSM N.V. of the Netherlands)

Cooperative Farm Chemicals Association, P.O. Box 308, Lawrence, Kan. 66044 (owned by Farmland Industries and Missouri Farmers Association)

Copolymer Rubber & Chemical Corp., P.O. Box 2591, Baton Rouge, La. 70821

Crompton & Knowles Corp., chemicals group, Rte. 208, Fair Lawn, N.J. 07410

Cyclo Chemicals Corp., 7500 North West 66th St., Miami, Fla. 33166

Dart Industries, P.O. Box 3157, Terminal Annex, Los Angeles, Calif. 90051 (subsidiary of Dart & Kraft)

Daubert Chemical Co., 1200 Jorie Blvd., Oak Brook, Ill. 60521

Dearborn Chemical, 300 Genesee St., Lake Zurich, Ill. 60047 (division of Chemed Corp.)

Detrex Chemical Industries, 4000 Town Ctr., Southfield, Mich. 48075

Dexter Chemical Corp., 845 Edgewater Rd., Bronx, N.Y. 10474

Dexter Corp., 1 Elm St., Windsor Locks, Conn. 06096

Diamond Shamrock Corp., 2300 Southland Ctr., Dallas, Tex. 75201

Diversey Wyandotte Corp., 1532 Biddle Ave., Wyandotte, Mich. 48192

Dixie Chemical Co., P.O. Box 13410, Houston, Tex. 77019

Dow Chemical U.S.A., 2020 Dow Ctr., Midland, Mich. 48640

Dow Corning Corp., P.O. Box 1767, Midland, Mich. 48640 (jointly owned by Dow Chemical Co. and Corning Glass Works)

Drew Chemical Corp., 1 Drew Chemical Plaza, Boonton, N.J. 07005 (subsidiary of U.S. Filter Corp.)

DuBois Chemicals, 1314 DuBois Tower, Cincinnati, Ohio 45202 (division of Chemed Corp.)

E. I. du Pont de Nemours & Co., 1007 Market St., Wilmington, Del. 19898

Eagle-Picher Industries, 580 Walnut St., Cincinnati, Ohio 45202

Eastern Chemical division, P.O. Box 2500, Smithtown, N.Y. 11787 (division of Guardian Chemical Corp.)

Eastman Chemical Products, P.O. Box 431, Kingsport, Tenn. 37662 (subsidiary of Eastman Kodak Co.)

Economics Laboratory, 370 Wabasha St., St. Paul, Minn. 55102

Emery Industries, 1300 Carew Tower, Cincinnati, Ohio 45202 (subsidiary of National Distillers & Chemical Corp.)

Emkay Chemical Co., 319-325 Second St., Elizabeth, N.J. 07206

Essex Chemical Corp., 1401 Broad St., Clifton, N.J. 07015

Ethyl Corp., 330 South Fourth St., Richmond, Va. 23219

Exxon Chemical Co., 1251 Ave. of the Americas, New York, N.Y. 10020 (division of Exxon Corp.)

Fairmount Chemical Co., 117 Blanchard St., Newark, N.J. 07105

Farmland Industries, P.O. Box 7305, Kansas City, Mo. 64116

Ferro Corp., 1 Erieview Plaza, Cleveland, Ohio 44114

Fiber Industries, P.O. Box 32414, Charlotte, N.C. 28232 (jointly owned by Celanese Corp. and Imperial Chemical Industries of the U.K.)

Filtrol Corp., 5959 West Century Blvd., Los Angeles, Calif. 90045 (subsidiary of U.S. Filter Corp.)

Firestone Synthetic Fibers Co., P.O. Box 450, Hopewell, Va. 23860 (division of Firestone Tire & Rubber Co.)

First Chemical Corp., P.O. Box 1427, Pascagoula, Miss. 39567 (subsidiary of First Mississippi Corp.)

Fisher Scientific Co., 711 Forbes Ave., Pittsburgh, Pa. 15219 (subsidiary of Allied Corp.)

FMC Corp., 200 East Randolph Dr., Chicago, Ill. 60601

FMC Corp., industrial chemical group, 2000 Market St., Philadelphia, Pa. 19103

Frank Enterprises, 700 Rose Ave., Columbus, Ohio 43219

Fritzsche Dodge & Olcott, 76 Ninth Ave., New York, N.Y. 10011 (owned by BASF A.G. of West Germany)

GAF Corp., 140 West 51st St., New York, N.Y. 10020

General Electric Co., engineered materials group, 500 West Wilson Bridge Rd., Columbus, Ohio 43085

General Electric Co., plastics business operations, 1 Plastics Ave., Pittsfield, Mass. 01201

General Latex & Chemical Corp., 666 Main St., Cambridge, Mass. 02139

General Tire & Rubber Co., chemicals/plastics/industrial products division, 1 General St., Akron, Ohio 44329

Georgia-Pacific Corp., 900 South West Fifth Ave., Portland, Ore. 97204

Givaudan Corp., 100 Delawanna Ave., Clifton, N.J. 07014 (an affiliate of L. Givaudan & Cie. of Switzerland)

Glyco, P.O. Box 700, Greenwich, Conn. 06836

B. F. Goodrich Co., chemical group, 6100 Oak Tree Blvd., Cleveland, Ohio 44131

Goodyear Tire & Rubber Co., chemical division, 1144 East Market St., Akron, Ohio 44316

W. R. Grace & Co., 1114 Ave. of the Americas, New York, N.Y. 10036 (owned 28% by Flick Group of West Germany)

Great Lakes Carbon Corp., 299 Park Ave., New York, N.Y. 10017

Great Lakes Chemical Corp., P.O. Box 2200, West Lafayette, Ind. 47906

Great Salt Lake Minerals & Chemicals Corp., P.O. Box 1190, Ogden, Utah 84402 (subsidiary of Gulf Resources & Chemical Corp.)

Grow Group, 200 Park Ave., New York, N.Y. 10017

GTE Products Corp., 1 Stamford Forum, Stamford, Conn. 06904 (division of General Telephone & Electronics Corp.)

Guardian Chemical Corp., P.O. Box 3990, Smithtown, N.Y. 11787

Gulf Oil Chemicals Co., P.O. Box 3766, Houston, Tex. 77253 (division of Gulf Oil Corp.)

C. P. Hall Co., 7300 South Central Ave., Chicago, Ill. 60638

Harshaw Chemical Co., 1945 East 97th St., Cleveland, Ohio 44106 (subsidiary of Gulf Oil Corp.)

Henkel Corp., 4620 West 77th St., Minneapolis, Minn. 55435 (owned by Henkel KGaA of West Germany)

Hercules, 910 Market St., Wilmington, Del. 19899

Hilton-Davis Chemical Co., 2235 Langdon Farm Rd., Cincinnati, Ohio 45237 (division of Sterling Drug)

Hitco, 1600 West 135th St., Gardena, Calif. 90249 (subsidiary of Armco)

Hoechst Fibers Industries, 1515 Broadway, New York, N.Y. 10036 (division of American Hoechst Corp.)

Humphrey Chemical Co., Devine St., North Haven, Conn. 06473

Philip A. Hunt Chemical Corp., Roosevelt Pl., Palisades Park, N.J. 07650 (partly owned by Turner & Newall Ltd. of the U.K.)

ICI Americas, Wilmington, Del. 19897 (owned by Imperial Chemical Industries of the U.K.)

IMC Chemical Group, 666 Garland Pl., Des Plaines, Ill. 60016 (subsidiary of International Minerals & Chemical Corp.)

Inmont Corp., 1255 Bird St., Clifton, N.J. 07011 (subsidiary of United Technologies Corp.)

International Flavors & Fragrances, 521 West 57th St., New York, N.Y. 10019

International Minerals & Chemical Corp., 2315 Sanders Rd., Northbrook, Ill. 60062

Kaiser Industrial Chemicals, 300 Lakeside Dr., Oakland, Calif. 94643 (division of Kaiser Aluminum & Chemical Corp.)
Kay-Fries, 200 Summit Ave., Montvale, N.J. 07645 (owned 75% by Dynamit Nobel A.G. of West Germany and 25% by Tennants Consolidated Ltd. of the U.K.)
Kerr-McGee Chemical Corp., Kerr-McGee Ctr., Oklahoma City, Okla. 73125 (subsidiary of Kerr-McGee Corp.)
Koppers Co., Koppers Bldg Pittsburgh, Pa. 15219
Lawter International, 990 Skokie Blvd., Northbrook, Ill. 60062
Liquid Air Corp., 1 Embarcadero Ctr., San Francisco, Calif. 94111
Liquid Carbonic Corp., 135 South La Salle St., Chicago, Ill. 60603 (subsidiary of Houston Natural Gas Corp.)
Lithium Corp. of America, 449 North Cox Rd., Gastonia, N.C. 28052 (subsidiary of Gulf Resources & Chemical Corp.)
Lonza, 22-10 Rte. 208, Fair Lawn, N.J. 07410 (owned by Lonza A.G. of Switzerland)
Lubrizol Corp., 29400 Lakeland Blvd., Wickliffe, Ohio 44092
MacKenzie Chemical Works, 1 Cordello Ave., Central Islip, N.Y. 11722
MacKenzie Interyar, P.O. Box 219, Bush, La. 70431 (part of MacKenzie Chemical Works)
Mallinckrodt, P.O. Box 5840, St. Louis, Mo. 63134
Millmaster Onyx Group, 99 Park Ave., New York, N.Y. 10016 (subsidiary of Gulf Oil Corp.)
Mobay Chemical Corp., Penn Lincoln Pkwy. West, Pittsburgh, Pa. 15205 (owned by Bayer A.G. of West Germany)
Mobil Chemical Co., 150 East 42nd St., New York, N.Y. 10017 (division of Mobil Oil Corp.)
Monsanto Co., 800 North Lindbergh Blvd., St. Louis, Mo. 63166
Morton Chemical Division, 2 North Riverside Plaza, Chicago, Ill. 60606 (division of Morton-Norwich Products)
Morton-Norwich Products, 110 North Wacker Dr., Chicago, Ill. 60606
M&T Chemicals, Woodbridge Rd. & Randolph Ave., Rahway, N.J. 07065 (subsidiary of Texasgulf)
Nalco Chemical Co., 2901 Butterfield Rd., Oak Brook, Ill. 60521
National Distillers & Chemical Corp., 99 Park Ave., New York, N.Y. 10016
National Starch & Chemical Corp., 10 Finderne Ave., Bridgewater, N.J. 08807 (owned by Unilever of the U.K.)
Neville Chemical Co., Neville Island, Pittsburgh, Pa. 15225
New England Nuclear Corp., 549 Albany St., Boston, Mass. 02118 (subsidiary of Du Pont)
NL Chemicals, P.O. Box 700, Hightstown, N.J. 08520 (division of NL Industries)
Northern Petrochemical Co., 2223 Dodge St., Omaha, Neb. 68102 (subsidiary of InterNorth)
Norton Chemical Process Products division, 12 East Ave., Tallmadge, Ohio 44278 (division of Norton Co.)
Noury Chemical Corp., 2153 Lockport-Olcott Rd., Burt, N.Y. 14028 (subsidiary of Armak Co.)
Occidental Chemical Corp., 1980 Post Oak Blvd., Houston, Tex. 77056 (subsidiary of Occidental Petroleum Corp.)
Olin Corp., 120 Long Ridge Rd., Stamford, Conn. 06904
Ozark-Mahoning Co., 1870 South Boulder Ave., Tulsa, Okla. 74119 (subsidiary of Pennwalt Corp.)
Pantasote, 26 Jefferson St., Passaic, N.J. 07055
Pearsall Chemical division, P.O. Box 437, Houston, Tex. 77001 (division of Witco Chemical Corp.)
Penick Corp., 1050 Wall St. West, Lyndhurst, N.J. 07071 (unit of CPC International)
Pennwalt Corp., 3 Pkwy., Philadelphia, Pa. 19102
Petrolite Corp., 100 North Broadway, St. Louis, Mo. 63102
Petro-Tex Chemical Corp., 8600 Park Place Blvd., Houston, Tex. 77017 (subsidiary of Tenneco)
Pfanstiehl Laboratories, 1219 Glen Rock Ave., Waukegan, Ill. 60085
Pfister Chemical, Linden Ave., Ridgefield, N.J. 07657
Phillips Petrochemicals Division, 15 Phillips Bldg., Bartlesville, Okla. 74004 (division of Phillips Petroleum Co.)
Phillips Fibers Corp., P.O. Box 66, Greenville, S.C. 29602 (subsidiary of Phillips Petroleum Co.)
Pierce Chemical Co., P.O. Box 117, Rockford, Ill. 61105
Polychrome Corp., P.O. Box 817, Yonkers, N.Y. 10702 (owned by Dainippon Ink & Chemicals of Japan)
PPG Industries, 1 Gateway Ctr., Pittsburgh, Pa. 15222
PQ Corp., P.O. Box 840, Valley Forge, Pa. 19482
Procter & Gamble Co., P.O. Box 599, Cincinnati, Ohio 45201
Publicker Industries, 777 West Putnam Ave., Greenwich, Conn. 06836
PVO International, World Trade Ctr., San Francisco, Calif. 94111 (subsidiary of Kay Corp.)
Quaker Oats Co., chemicals division, P.O. Box 3514, Chicago, Ill. 60654
Reichhold Chemicals, 523 North Broadway, White Plains, N.Y. 10603
Reilly Tar & Chemical Corp., 151 North Delaware St., Indianapolis, Ind. 46204
Rhône-Poulenc, 52 Vanderbilt Ave., New York, N.Y. 10017 (subsidiary of Rhône-Poulenc S.A. of France)
Richardson Co., 2400 East Devon Ave., Des Plaines, Ill. 60018
Rilsan Corp., 139 Harristown Rd., Glen Rock, N.J. 07452 (owned by ATO Chimie S.A. of France)
Ritter International, 4001 Goodwin Ave., Los Angeles, Calif. 90039
Riverdale Chemical Co., 220 East 17th St., Chicago Heights, Ill. 60411
Rohm & Haas Co., Independence Mall West, Philadelphia, Pa. 19105
R.S.A. Corp., 690 Saw Mill River Rd., Ardsley, N.Y. 10502
Rubicon Chemicals, P.O. Box 751, Wilmington, Del. 19897 (subsidiary of ICI Americas)
Sandoz, Rte. 10, East Hanover, N.J. 07936 (owned by Sandoz A.G. of Switzerland)
SCM Corp., 299 Park Ave., New York, N.Y. 10017
Shell Chemical Co., P.O. Box 2463, Houston, Tex. 77001 (division of Shell Oil Co.)
Shepherd Chemical Co., 4900 Beech St., Cincinnati, Ohio 45212
Stauffer Chemical Co., Nyala Farm Rd., Westport, Conn. 06881
Stepan Chemical Co., Edens & Winnetka Rds., Northfield, Ill. 60093
Sterling Organics, 90 Park Ave., New York, N.Y. 10016 (division of Sterling Drug)
Sun Chemical Corp., 200 Park Ave., New York, N.Y. 10017
Sybron Corp., 1100 Midtown Towers, Rochester, N.Y. 14604
Tenneco Chemicals, Park 80 Plaza West, Saddle Brook, N.J. 07662 (division of Tenneco)
Texaco Chemical Co., P.O. Box 430, Bellaire, Tex. 77401 (division of Texaco)
Texasgulf, High Ridge Park, Stamford, Conn. 06904 (owned by Société Nationale Elf-Aquitaine S.A. of France)
TH Agriculture & Nutrition Co., P.O. Box 2700, Kansas City, Kan. 66110 (subsidiary of North American Philips Corp.)
Thompson-Hayward Chemical Co., P.O. Box 2383, Kansas City, Kan. (member of the Harrisons & Crosfield Group of the U.K.)
Toms River Chemical Corp., P.O. Box 71, Toms River, N.J. 08753 (subsidiary of Ciba-Geigy Corp.)
Union Carbide Corp., Old Ridgebury Rd., Danbury, Conn. 06817
Union Chemicals division, 461 South Boylston St., Los Angeles, Calif. 90017 (division of Union Oil Co. of California)
Uniroyal Chemical, Spencer St., Naugatuck, Conn. 06770 (division of Uniroyal)
United Nuclear Corp., 7700 Leesburg Pike, Falls Church, Va. 22043 (subsidiary of UNC Resources)
U.S. Borax & Chemical Corp., 3075 Wilshire Blvd., Los Angeles, Calif. 90010 (owned by Rio Tinto Zinc Corp. of the U.K.)
U.S. Industrial Chemicals Co., 99 Park Ave., New York, N.Y. 10016 (division of National Distillers & Chemical Corp.)
USM Corp., 426 Colt Hwy., Farmington, Conn. 06032 (subsidiary of Emhart Corp.)
USS Chemicals, 600 Grant St., Pittsburgh, Pa. 15230 (division of U.S. Steel Corp.)
USS Novamont, 600 Grant St., Pittsburgh, Pa. 15230 (subsidiary of U.S. Steel Corp.)
Vanderbilt Chemical Corp., 30 Winfield St., Norwalk, Conn. 06855 (subsidiary of R. T. Vanderbilt Co.)
Velsicol Chemical Corp., 341 East Ohio St., Chicago, Ill. 60611 (subsidiary of Northwest Industries)
Ventron division, 150 Andover St., Danvers, Mass. 01923 (division of Thiokol Corp.)
Virginia Chemicals, 3340 West Norfolk Rd., Portsmouth, Va. 23703 (subsidiary of Celanese Corp.)
Vistron Corp., Midland Bldg., Cleveland, Ohio 44115 [subsidiary of Standard Oil Co. (Ohio)]
Vulcan Materials Co., P.O. Box 7497, Birmingham, Ala. 35253
West Agro-Chemical, P.O. Box 1386, Shawnee, Kan. 66222 (subsidiary of West Chemical Products)
West Chemical Products, 1000 Herrontown Rd., Princeton, N.J. 08540
Williams Cos., 1 Williams Ctr., Tulsa, Okla. 74103
Witco Chemical Corp., 277 Park Ave., New York, N.Y. 10017

Drugs

Abbott Laboratories, 1400 Sheridan Rd., North Chicago, Ill. 60064
American Home Products Corp., 685 Third Ave., New York, N.Y. 10017
Armour Pharmaceutical Co., 303 South Broadway, Tarrytown, N.Y. 10591 (subsidiary of Revlon)
Astra Pharmaceutical Products, P.O. Box 1089, Framingham, Mass. 01701
Ayerst Laboratories, 685 Third Ave., New York, N.Y. 10017 (division of American Home Products Corp.)
Baxter Travenol Laboratories, 1 Baxter Pkwy., Deerfield, Ill. 60015
Breon Laboratories, 90 Park Ave., New York, N.Y. 10016 (subsidiary of Sterling Drug)
Bristol Laboratories, P.O. Box 657, Syracuse, N.Y. 13201 (division of Bristol-Myers Co.)
Bristol-Myers Co., 345 Park Ave., New York, N.Y. 10022
Burroughs Wellcome Co., 3030 Cornwallis Rd., Research Triangle Park, N.C. 27709 (owned by Wellcome Foundation Ltd. of the U.K.)
Carter-Wallace, 767 Fifth Ave., New York, N.Y. 10022
Ciba-Geigy Corp., pharmaceuticals division, 556 Morris Ave., Summit, N.J. 07901 (owned by Ciba-Geigy A.G. of Switzerland)
Cooper Laboratories, 3145 Porter Dr., Palo Alto, Calif. 94304
Cutter Laboratories, Fourth and Parker St., Berkeley, Calif. 94710 (owned by Bayer A.G. of West Germany)
Dorsey Laboratories, P.O. Box 83288, Lincoln, Neb. 68501 (division of Sandoz of Switzerland)
Endo Laboratories, 1000 Stewart Ave., Garden City, N.Y. 11530 (subsidiary of Du Pont)
Ethicon, U.S. Hwy. 22, Somerville, N.J. 08876 (subsidiary of Johnson & Johnson)
Ganes Chemicals, 1114 Ave. of the Americas, New York, N.Y. 10036 (owned by Siegfried A.G. of Switzerland)
Hoechst-Roussel Pharmaceuticals, Rte. 202-206 North, Somerville, N.J. 08876 (subsidiary of American Hoechst)
Hoffmann-La Roche, 340 Kingsland St., Nutley, N.J. 07110 (owned by F. Hoffmann-La Roche & Co. A.G. of Switzerland)
ICN Pharmaceuticals, 2727 Campus Dr., Irvine, Calif. 92664
Lederle Laboratories, Middletown Rd., Pearl River, N.Y. 10965 (division of American Cyanamid Co.)
Eli Lilly & Co., 307 East McCarty St., Indianapolis, Ind. 46285
Marion Laboratories, 10236 Bunker Ridge Rd., Kansas City, Mo. 64137

McNeil Laboratories, Camp Hill Rd., Fort Washington, Pa. 19034 (affiliate of Johnson & Johnson)
Mead Johnson & Co., 2400 Pennsylvania St., Evansville, Ind. 47721 (subsidiary of Bristol-Myers Co.)
Merck & Co., P.O. Box 2000, Rahway, N.J. 07065
Merrell Dow Pharmaceuticals, 2110 East Galbraith Rd., Cincinnati, Ohio 45215 (subsidiary of Dow Chemical Co.)
Miles Laboratories, P.O. Box 40, Elkhart, Ind. 46515 (owned by Bayer A.G. of West Germany)
Norwich-Eaton Pharmaceuticals, 17 Eaton Ave., Norwich, N.Y. 13815 (division of Procter & Gamble)
Organon, 375 Mt. Pleasant Ave., West Orange, N.J. 07052 (division of Akzona)
Ortho Pharmaceutical Corp., Raritan, N.J. 08869 (division of Johnson & Johnson)
Parke-Davis, P.O. Box 118, G.P.O., Detroit, Mich. 48232 (division of Warner-Lambert Co.)
Pfizer, 235 East 42nd St., New York, N.Y. 10017
Philips Roxane Laboratories, P.O. Box 16532, Columbus, Ohio 43216 (division of Boehringer Ingelheim Ltd. of West Germany)
Purdue Frederick Co., 50 Washington St., Norwalk, Conn. 06856
Rachelle Laboratories, 700 Henry Ford Ave., Long Beach, Calif. 90801 (subsidiary of International Rectifier Corp.)
Richardson-Vicks, 10 Westport Rd., Wilton, Conn. 06897
Riker Laboratories, 19901 Nordhoff St., Northridge, Calif. 91324 (subsidiary of 3M Co.)
A. H. Robins Co., 1407 Cummings Dr., Richmond, Va. 23220
Wm. H. Rorer, 500 Virginia Dr., Fort Washington, Pa. 19034 (subsidiary of Rorer Group)
Sandoz Pharmaceuticals, Rte. 10, East Hanover, N.J. 07936 (owned by Sandoz of Switzerland)
R. P. Scherer Corp., 2075 West Big Beaver St., Troy, Mich. 48084
Schering-Plough Corp., P.O. Box 500, Kenilworth, N.J. 07033
G. D. Searle & Co., P.O. Box 1045, Skokie, Ill. 60076
Smith Kline & French Laboratories, 1500 Spring Garden St., Philadelphia, Pa. 19101 (division of SmithKline Beckman Corp.)
Squibb Corp., 40 West 57th St., New York, N.Y. 10019
Sterling Drug, 90 Park Ave., New York, N.Y. 10016
Stuart Pharmaceuticals, New Murphy Rd. and Concord Pike, Wilmington, Del. 19897 (division of ICI Americas)
Syntex Corp., 3401 Hillview Ave., Palo Alto, Calif. 94304
Upjohn Co., 7000 Portage Rd., Kalamazoo, Mich. 49001
USV Pharmaceutical Corp., 1 Scarsdale Rd., Tuckahoe, N.Y. 10707 (division of Revlon)
Wallace Laboratories, Half Acre Rd., Cranbury, N.J. 08512 (division of Carter-Wallace)
Warner-Lambert Co., 201 Tabor Rd., Morris Plains, N.J. 07950
Westwood Pharmaceuticals, 468 Dewitt St., Buffalo, N.Y. 14213 (division of Bristol-Myers Co.)
Winthrop Laboratories, 90 Park Ave., New York, N.Y. 10016 (division of Sterling Drug)
Wyeth Laboratories, P.O. Box 8299, Philadelphia, Pa. 19101 (division of American Home Products Corp.)

Personal-care products

Alberto-Culver Co., 2525 Armitage Ave., Melrose Park, Ill. 60160
Avon Products, 9 West 57th St., New York, N.Y. 10019
Chesebrough-Ponds, 33 Benedict Pl., Greenwich, Conn. 06830
Clairol, 345 Park Ave., New York, N.Y. 10154 (subsidiary of Bristol-Myers Co.)
Colgate-Palmolive Co., 300 Park Ave., New York, N.Y. 10022
Fabergé, 1345 Ave. of the Americas, New York, N.Y. 10019
Max Factor & Co., 1655 McCadden Pl., Hollywood, Calif. 90028 (subsidiary of Norton Simon)
Gillette Co., Prudential Tower Bldg., Boston, Mass. 02199
Andrew Jergens Co., 2535 Spring Grove Ave., Cincinnati, Ohio 45214 (subsidiary of American Brands)
Lever Brothers Co., 390 Park Ave., New York, N.Y. 10022 (owned by Unilever of the U.K.)
Noxell Corp., P.O. Box 1799, Baltimore, Md. 21203
Purex Corp., 5101 Clark Ave., Lakewood, Calif. 90712
Revlon, 767 Fifth Ave., New York, N.Y. 10022
Shulton, 697 U.S. Hwy. 46, Clifton, N.J. 07015 (subsidiary of American Cyanamid Co.)

Coatings

Cook Paint & Varnish Co., P.O. Box 389, Kansas City, Mo. 64141
DeSoto, 1700 South Mt. Prospect Rd., Des Plaines, Ill. 60018
Dutch Boy, 2325 Hollins Ferry Rd., Baltimore, Md. 21230 (division of Sherwin-Williams Co.)
Glidden Coatings & Resins, 900 Union Commerce Tower, Cleveland, Ohio 44115 (division of SCM Corp.)
Guardsman Chemicals, 1350 Steele Ave., S.W., Grand Rapids, Mich. 49507
Lilly Industrial Coatings, P.O. Box 946, Indianapolis, Ind. 46206
Benjamin Moore & Co., 51 Chestnut Ridge Rd., Montvale, N.J. 07645
O'Brien Corp., 450 East Grand Ave., South San Francisco, Calif. 94080
Porter Paint Co., 13th & Walnut St., Louisville, Ky. 40201
Pratt & Lambert, P.O. Box 22, Buffalo, N.Y. 14240
Rust-Oleum Corp., 11 Hawthorn Pkwy., Vernon Hills, Ill. 60061
Sherwin-Williams Co., 101 Prospect Ave., Cleveland, Ohio 44115
Sinclair Paint Co., 2500 South Atlantic Blvd., Los Angeles, Calif. 90040 (division of Insilco Corp.)
Sinnett Industrial Coatings, 1380 Kingsland Ave., St. Louis, Mo. 63133
Valspar Corp., 1101 Third St. South, Minneapolis, Minn. 55415

Petroleum

Amerada Hess Corp., 1 Hess Plaza, Woodbridge, N.J. 07095
American Petrofina, P.O. Box 2159, Dallas, Tex. 75221
Ashland Oil, P.O. Box 391, Ashland, Ky. 41101
Atlantic Richfield Co., 515 South Flower St., Los Angeles, Calif. 90071
Cities Service Co., P.O. Box 300, Tulsa, Okla. 74102
Clark Oil & Refining Corp., 8530 West National Ave., Milwaukee, Wis. 53227
Conoco, High Ridge Park, Stamford, Conn. 06905 (subsidiary of Du Pont)
Cosden Oil & Chemical Co., P.O. Box 410, Dallas, Tex. 75221 (subsidiary of American Petrofina)
Exxon Corp., 1251 Ave. of the Americas, New York, N.Y. 10020
Getty Oil Co., 3810 Wilshire Blvd., Los Angeles, Calif. 90054
Gulf Oil Corp., P.O. Box 1166, Pittsburgh, Pa. 15230
Kerr-McGee Corp., Kerr-McGee Ctr., Oklahoma City, Okla. 73125
Marathon Oil Co., 539 South Main St., Findlay, Ohio 45840 (subsidiary of U.S. Steel Corp.)
Marathon Petroleum Co., 539 South Main St., Findlay, Ohio 45840 (subsidiary of Marathon Oil Co.)
Mobil Oil Corp., 150 East 42nd St., New York, N.Y. 10017
Murphy Oil Corp., 200 Jefferson Ave., El Dorado, Ark. 71730
Occidental Petroleum Corp., 10889 Wilshire Blvd., Los Angeles, Calif. 90024
Pennzoil Co., P.O. Box 2967, Houston, Tex. 77001
Phillips Petroleum Co., Phillips Bldg., Bartlesville, Okla. 74004
Quaker State Oil Refining Corp., 255 Elm St., Oil City, Pa. 16301
Shell Oil Co., 1 Shell Plaza, Houston, Tex. 77001
Standard Oil Co. of California, 225 Bush St., San Francisco, Calif. 94104
Standard Oil Co. (Ind.), 200 East Randolph Dr., Chicago, Ill. 60601
Standard Oil Co. (Ohio), Midland Bldg., Cleveland, Ohio 44115 (owned 53% by BP Ltd. of the U.K.)
Sun Co., 240 Radnor-Chester Rd., St. Davids, Pa. 19087
Tenneco, P.O. Box 2511, Houston, Tex. 77001
Texaco, 2000 Westchester Ave., White Plains, N.Y. 10650
Union Oil Co. of California, 461 South Boylston St., Los Angeles, Calif. 90017

Rubber

American Biltrite, 575 Technology Sq., Cambridge, Mass. 02139
Armstrong Rubber Co., 500 Sargent Dr., New Haven, Conn. 06507
Carlisle Corp., 1700 DuBois Tower, Cincinnati, Ohio 45202
Cooper Tire & Rubber Co., Lima and Western Ave., Findlay, Ohio 45840
Firestone Tire & Rubber Co., 1200 Firestone Pkwy., Akron, Ohio 44317
Gates Rubber Co., 999 South Broadway, Denver, Colo. 80217
General Tire & Rubber Co., 1 General St., Akron, Ohio 44329
B. F. Goodrich Co., 500 South Main St., Akron, Ohio 44318
Goodyear Tire & Rubber Co., 1144 East Market St., Akron, Ohio 44316
Mohawk Rubber Co., 50 Executive Pkwy., Hudson, Ohio 44236
St. Clair Rubber Co., P.O. Box 566, St. Clair Shores, Mich. 48080
Uniroyal, Oxford Management & Research Ctr., Middlebury, Conn. 06749

Paper and forest products

Bemis Co., 800 Northstar Ctr., Minneapolis, Minn. 55402
Boise Cascade Corp., 1 Jefferson Sq., Boise, Idaho 83728
Champion International Corp., 1 Landmark Sq., Stamford, Conn. 06921
Consolidated Papers, First Ave. North, Wisconsin Rapids, Wis. 54494
Container Corp. of America, 1 First National Plaza, Chicago, Ill. 60603 (subsidiary of Mobil Oil Corp.)
Continental Forest Industries, 21 Harbor Plaza, Stamford, Conn. 06904 (member of Continental Group)
Crown Zellerbach Corp., 1 Bush St., San Francisco, Calif. 94104
Diamond International Corp., 733 Third Ave., New York, N.Y. 10017
Georgia-Pacific Corp., 900 South West Fifth Ave., Portland, Ore. 97204
Great Northern Nekoosa Corp., 75 Prospect St., Stamford, Conn. 06901
Hammermill Paper Co., 1442 East Lake Rd., Erie, Pa. 16533
Inland Container Corp., 151 North Delaware St., Indianapolis, Ind. 46206
International Paper Co., P.O. Box 973, Wall St. Station, New York, N.Y. 10268
ITT Rayonier, 1177 Summer St., Stamford, Conn. 06904 (subsidiary of International Telephone & Telegraph Corp.)
Kimberly-Clark Corp., 128 North Lake St., Neenah, Wis. 54956
Mead Corp., Courthouse Plaza, Northeast, Dayton, Ohio 45463
Potlatch Corp., 1 Maritime Plaza, San Francisco, Calif. 94111
Procter & Gamble Paper Products Co., P.O. Box 866, Oxnard, Calif. 93032
St. Regis Paper Co., 150 East 42nd St., New York, N.Y. 10017
Scott Paper Co., Scott Plaza, Philadelphia, Pa. 19113
Union Camp Corp 1600 Valley Rd., Wayne, N.J. 07470
Westvaco Corp., 299 Park Ave., New York, N.Y. 10017
Weyerhaeuser Co., Tacoma, Wash. 98477

Metals and minerals

Allegheny International, 2 Oliver Plaza, Pittsburgh, Pa. 15222
Allied-Kelite Products division, 2400 East Devon Ave., Des Plaines, Ill. 60018 (division of Richardson Co.)
Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh, Pa. 15219
Amax, Amax Ctr., Greenwich, Conn. 06836
Anaconda Co., 555—17th St., Denver, Colo. 80271 (subsidiary of Atlantic Richfield Co.)
Armco, 703 Curtis St., Middletown, Ohio 45043
Asarco, 120 Broadway, New York, N.Y. 10271

Bethlehem Steel Corp., 701 East Third St., Bethlehem, Pa. 18016
Carpenter Technology Corp., 150 West Bern St., Reading, Pa. 19603
Cerro Metal Products, P.O. Box 388, Bellefonte, Pa. 16823 (division of Marmon Group)
Chromalloy American Corp., 120 South Central Ave., St. Louis, Mo. 63105
Climax Molybdenum Co., 1 Greenwich Plaza, Greenwich, Conn. 06830 (division of Amax)
Colt Industries, P.O. Box 226, Midland, Pa. 15059
Copperweld Corp., 2 Oliver Plaza, Pittsburgh, Pa. 15222
Cyclops Corp., 650 Washington Rd., Pittsburgh, Pa. 15228
Duval Corp., P.O. Box 2967, Houston, Tex. 77001 (subsidiary of Pennzoil Co.)
Engelhard Corp., 1221 Ave. of the Americas, New York, N.Y. 10020
Fansteel, 1 Tantalum Pl., North Chicago, Ill. 60064
Foote Mineral Co., Rte. 100, Exton, Pa. 19341 (owned 90.8% by Newmont Mining Corp.)
Freeport Minerals Co., 200 Park Ave., New York, N.Y. 10166 (subsidiary of Freeport-McMoRan)
Gulf Resources & Chemical Corp., 1100 Milam Bldg., Houston, Tex. 77002
Handy & Harman, 850 Third Ave., New York, N.Y. 10022
Howmet Aluminum Corp., 475 Steamboat Rd., Greenwich, Conn. 06830 (affiliate of Pechiney-Ugine-Kuhlmann Corp. of France)
Inland Steel Co., 30 West Monroe St., Chicago, Ill 60603
Interlake, 2015 Spring Rd., Oak Brook, Ill. 60521
International Nickel Co., 1 New York Plaza, New York, N.Y. 10004
Johnson Matthey, 4 Malin Rd., Malvern, Pa. 19355 (owned by Johnson Matthew Investments)
Jones & Laughlin Steel Corp., Robinson Plaza 3, Rte. 60, Robinson Township, Pittsburgh, Pa. 15205 (subsidiary of LTV Corp.)
Kaiser Aluminum & Chemical Corp., 300 Lakeside Dr., Oakland, Calif. 94643
Kaiser Steel Corp., 300 Lakeside Dr., Oakland, Calif. 94643
Kawecki Berylco Industries, P.O. Box 1462, Reading, Pa. 19603 (subsidiary of Cabot Corp.)
Kennametal, P.O. Box 30700, Raleigh, N.C. 27622
Kennecott Minerals Co., P.O. Box 11248, Salt Lake City, Utah 84107 [subsidiary of Standard Oil Co. (Ohio)]
Martin Marietta Aluminum, 6801 Rockledge Dr., Bethesda, Md. 20817 (subsidiary of Martin Marietta Corp.)
Molycorp, 461 South Boylston St., Los Angeles, Calif. 90017 (subsidiary of Union Oil Co. of California)
National Steel Corp., 2800 Grant Bldg., Pittsburgh, Pa. 15219
Phelps Dodge Refining Corp., 300 Park Ave., New York, N.Y. 10022 (subsidiary of Phelps Dodge Corp.)
Republic Steel Corp., P.O. Box 6778, Cleveland, Ohio 44101
Revere Copper & Brass, 605 Third Ave., New York, N.Y 10158 (owned 33% by Asarco)
Reynolds Metals Co., P.O. Box 27003, Richmond, Va. 23261
St. Joe Minerals Corp., 250 Park Ave., New York, N.Y. 10017 (subsidiary of Fluor Corp.)
Teledyne Wah Chang Albany, P.O. Box 460, Albany, Ore. 97321 (subsidiary of Teledyne)
Titanium Metals Corp. Of America, P.O. Box 2824, Pittsburgh, Pa. 15230 (jointly owned by Allegheny International and NL Industries)
U.S. Steel Corp., 600 Grant St., Pittsburgh, Pa. 15230

Food

American Maize-Products Co., 22 Gate House Rd., Stamford, Conn. 06902
Amstar Corp., 1251 Ave. of the Americas, New York, N.Y. 10020
Anderson Clayton Foods, 7839 Churchill Way, Dallas, Tex. 75251 (division of Anderson Clayton & Co.)
Archer Daniels Midland Co., P.O. Box 1470, Decatur, Ill. 62525
Armour & Co., Greyhound Tower, Phoenix, Ariz. 85077 (subsidiary of Greyhound Corp.)
Beatrice Foods Co., 2 North La Salle St., Chicago, Ill. 60602
Borden, 180 East Broad St., Columbus, Ohio 43215
Campbell Soup Co., Campbell Pl., Camden, N.J. 08101
Carnation Co., 5045 Wilshire Blvd., Los Angeles, Calif. 90036
Central Soya Co., 1300 Ft. Wayne National Bank Bldg., Ft. Wayne, Ind. 46802
Consolidated Foods Corp., 135 South La Salle St., Chicago, Ill. 60603
CPC International, International Plaza, Englewood Cliffs, N.J. 07632
Del Monte Corp., P.O. Box 3575, San Francisco, Calif. 94119 (subsidiary of R. J. Reynolds Industries)
Esmark, 55 East Monroe St., Chicago, Ill. 60603
General Foods Corp., 250 North St., White Plains, N.Y. 10625
General Host Corp., 22 Gate House Rd., Stamford, Conn. 06902
General Mills, P.O. Box 1113, Minneapolis, Minn. 55440
Gerber Products Co., Fremont, Mich. 49412
H. J. Heinz Co., 1062 Progress Rd., Pittsburgh, Pa. 15212
Hershey Foods Corp., 19 East Chocolate Ave., Hershey, Pa. 17033
Geo. A. Hormel & Co., Austin, Minn. 55912
Kellogg Co., 235 Porter St., Battle Creek, Mich. 49016
Kraft, Kraft Ct., Glenview, Ill. 60025 (subsidiary of Dart & Kraft)
Libby, McNeill & Libby, 200 South Michigan Ave., Chicago, Ill. 60604
Thomas J. Lipton, 800 Sylvan Ave., Englewood Cliffs, N.J. 07632
McCormick & Co., 11350 McCormick Rd., Hunt Valley, Md. 21031
Nabisco Brands, 625 Madison Ave., New York, N.Y. 10022
Norton Simon, 277 Park Ave., New York, N.Y. 10017
Pepperidge Farm, P.O. Box 5500, Norwalk, Conn. 06856 (subsidiary of Campbell Soup Co.)
Pet, 400 South Fourth St., St. Louis, Mo. 63166 (subsidiary of IC Industries)
Pillsbury Co., 608 Second Ave. South, Minneapolis, Minn. 55402
Quaker Oats Co., P.O. Box 3514, Chicago, Ill. 60654
Ralston Purina Co., 835 South Eighth St., St. Louis, Mo. 63188
A. E. Staley Mfg. Co., P.O. Box 151, Decatur, Ill. 62525
Stokely-Van Camp, 941 North Meridian St., Indianapolis, Ind. 46206
Swift & Co., 115 West Jackson Blvd., Chicago, Ill. 60604 (subsidiary of Esmark)
Universal Foods Corp., 433 East Michigan St., Milwaukee, Wis. 53202
Wm. Wrigley Jr. Co., 410 North Michigan Ave., Chicago, Ill. 60611

Other manufacturers

Abcor, 850 Main St., Wilmington, Mass. 01887 (subsidiary of Koch Engineering Co.)
Aerojet-General Corp., 10300 North Torrey Pines Rd., La Jolla, Calif. 92037 (subsidiary of General Tire & Rubber Co.)
Allis-Chalmers Corp., P.O. Box 512, Milwaukee, Wis. 53201
Alza Corp., 950 Page Mill Rd., Palo Alto, Calif. 94304
AM Bruning, 1800 Bruning Dr. West, Itasca, Ill. 60143 (division of AM International)
American Air Filter Co., P.O. Box 35530, Louisville, Ky. 40232
American Brands, 245 Park Ave., New York, N.Y. 10167
American Can Co., American La., Greenwich, Conn. 06830
American Hospital Supply Corp., 1740 Ridge Ave., Evanston, Ill. 60204
American Motors Corp., 14250 Plymouth Rd., Detroit, Mich. 48232
American Optical Corp., 14 Mechanic St., Southbridge, Mass. 01550 (subsidiary of Warner-Lambert Co.)
American Standard, 40 West 40th St., New York, N.Y. 10018
American Telephone & Telegraph Co., 195 Broadway, New York, N.Y. 10007
AM International, 1900 Ave. of the Stars, Los Angeles, Calif. 90067
AMP, P.O. Box 3608, Harrisburg, Pa. 17105
Ampex Corp., 401 Broadway, Redwood City, Calif. 94063 (part of Signal Companies)
Anchor Hocking Corp., 70 Glass Ave., Lancaster, Ohio 43130
Anheuser-Busch, 721 Pestalozzi St., St. Louis, Mo. 63118
Armstrong World Industries, Liberty and Charlotte St., Lancaster, Pa. 17604
Atlantic Research Corp., 5390 Cherokee Ave., Alexandria, Va. 22314
Avco Corp., 1275 King St., Greenwich, Conn. 06830
Babcock & Wilcox Co., P.O. Box 1126, Wall St. Station, New York, N.Y. 10268 (unit of J. Ray McDermott Co.)
Badger Co., 1 Broadway, Cambridge, Mass. 02142 (division of Raytheon Co.)
Baird Corp., 125 Middlesex Tpke., Bedford, Mass. 01730
Bausch & Lomb, 1 Lincoln First Sq., Rochester, N.Y. 14601
Beckman Instruments, 2500 Harbor Blvd., Fullerton, Calif. 92634 (subsidiary of SmithKline Beckman Corp.)
Becton Dickinson & Co., Mack Center Dr., Paramus, N.J. 07652
Becton Dickinson Immunodiagnostics, Mountain View Ave., Orangeburg, N.Y. 10962 (division of Becton Dickinson & Co.)
Bell & Howell Co., 7100 McCormick Blvd., Chicago, Ill. 60645
Bendix Corp., Bendix Ctr., Southfield, Mich. 48037
Bio-Dynamics, 9115 Hague Rd., Indianapolis, Ind. 46250
Blaw-Knox Equipment, Blaw St., Blawnox, Pa. 15238 (division of White Consolidated Industries)
Borg-Warner Corp., 200 South Michigan Ave., Chicago, Ill. 60604
Bostik division, 20846 South Normandie Ave., Torrance, Calif. 90502 (unit of Emhart)
Budd Co., 3155 West Big Beaver Rd., Troy, Mich. 48084
Burlington Industries, P.O. Box 21207, Greensboro, N.C. 27420
Burroughs Corp., Burroughs Pl., Detroit, Mich. 48232
Carborundum Co., P.O. Box 337, Niagara Falls, N.Y. 14302 (division of Kennecott Corp.)
Cargill, P.O. Drawer 5630, Minneapolis, Minn. 55440
Caterpillar Tractor Co., 100 N.E. Adams St., Peoria, Ill. 61629
Celotex Corp., P.O. Box 22602, Tampa, Fla. 33622 (division of Jim Walter Corp.)
Chemical Products Corp., P.O. Box 449, Cartersville, Ga. 30120
Chrysler Corp., P.O. Box 1919, Detroit, Mich. 48288
C&I Girdler, P.O. Box 32940, Louisville, Ky. 40232 (division of Bechtel Corp.)
Combustion Engineering, 900 Long Ridge Rd., Stamford, Conn. 06902
Continental Can Co. U.S.A., 51 Harbor Plaza, Stamford, Conn. 06904 (member of Continental Group)
Coors Porcelain Co. 600 Ninth St., Golden, Colo. 80401 (division of Adolph Coors Co.)
Corning Glass Works, 80 Houghton Park, Corning, N.Y. 14830
Crown Cork & Seal Co., 9300 Ashton Rd., Philadelphia, Pa. 19136
Curtiss-Wright Corp., 1 Passaic St., Wood-Ridge, N.J. 07075
Dan River International Corp., 111 West 40th St., New York, N.Y. 10018
Dayco Corp., 333 West First St., Dayton, Ohio 45402
Deere & Co., John Deere Rd., Moline, Ill. 61265
Dorr-Oliver, 79 Havemeyer La., Stamford, Conn. 06904 (subsidiary of Kennecott Corp.)
Dresser Industries, 1505 Elm St., Dallas, Tex. 75201
Eastman Kodak Co., 343 State St., Rochester, N.Y. 14650
El Paso Co., P.O. Box 2185, Houston, Tex. 77001
Evans Products Co., P.O. Box 3295, Portland, Ore. 97208
Fairchild Camera & Instrument Corp., 464 Ellis St., Mountain View, Calif. 94042
Fasson Industrial Division, 252 Chester St., Painesville, Ohio 44077 (division of Avery International)
Flintkote Co., 777 Long Ridge Rd., Stamford, Conn. 06902 (part of Genstar Ltd.)

Fluor Corp., 3333 Michelson Dr., Irvine, Calif. 92730
Ford, Bacon & Davis, 2 Broadway, New York, N.Y. 10004
Ford Motor Co., American Rd., Dearborn, Mich. 48127
Foremost-McKesson, 1 Post St., San Francisco, Calif. 94104
Foster Wheeler Energy Corp., 110 South Orange Ave., Livingston,N.J. 07039
Foxboro Co., 86 Neponset Ave., Foxboro, Mass. 02035
Franklin GNO Corp., P.O. Box 3206, West Palm Beach, Fla. 33402
H. B. Fuller Co., 2402 Kasota Ave., St. Paul, Minn. 55108
GATX Corp., 120 South Riverside Plaza, Chicago, Ill. 60606
General Dynamics Corp., Pierre Laclede Ctr., St. Louis, Mo. 63105
General Electric Co., 3135 Easton Ave., Fairfield, Conn. 06431
General Motors Corp., 3044 West Grand Blvd., Detroit, Mich. 48202
General Resource Corp., 203 South Third St., Hopkins, Minn. 55343
General Telephone & Electronics Corp., 1 Stamford Forum, Stamford, Conn. 06904
Grain Processing Corp., P.O. Box 349, Muscatine, Iowa 52761
Greyhound Corp., 111 West Clarendon Ave., Phoenix, Ariz. 85077
Grumman Corp., 1111 Stewart Ave., Bethpage, N.Y. 11714
Gulf & Western Industries, P.O. Box 4239, Grand Central Station, New York, N.Y. 10164
G&W Electric Specialty Co., 3500 West 127th St., Blue Island, Ill. 60406
Honeywell, Honeywell Plaza at 27th St., Minneapolis, Minn. 55408
Inco Electro-Energy, 5 Penn Ctr. Plaza, Philadelphia, Pa. 19103
Indian Head, 1211 Ave. of the Americas, New York, N.Y. 10036
Instrumentation Laboratory, 113 Hartwell Ave., Lexington, Mass. 02173
International Business Machines Corp., Old Orchard Rd., Armonk, N.Y. 10504
International Harvester Co., 401 North Michigan Ave., Chicago, Ill. 60611
International Playtex, 888 Seventh Ave., New York, N.Y. 10019 (division of Esmark)
InterNorth, 2223 Dodge St., Omaha, Neb. 68102
Interpace Corp., 260 Cherry Hill Rd., Parsippany, N.J. 07054
Ionics, 65 Grove St., Watertown, Mass. 02172
Itek Corp., 10 Maguire Rd., Lexington, Mass. 02173
Johnson & Johnson, 501 George St., New Brunswick, N.J. 08903
Johnson Wax, 1521 Howe St., Racine, Wis. 53403
Jones-Blair Co., P.O. Box 35286, Dallas, Tex. 75235
Leeds & Northrup Co., Sumneytown Pike, North Wales, Pa. 19454
Libbey-Owens-Ford Co., 811 Madison Ave., Toledo, Ohio 43695
Liggett Group, 4100 Roxboro Rd., Durham, N.C. 27702
Litton Industries, 360 North Crescent Dr., Beverly Hills, Calif. 90210
Lockheed Corp., 2555 North Hollywood Way, Burbank, Calif. 91520
Loctite Corp., 999 North Mountain Rd., Newington, Conn. 06111
Lorillard, 666 Fifth Ave., New York, N.Y. 10103 (division of Loews Corp.)
LTV Corp., P.O. Box 225003, Dallas, Tex. 75265
Lummus Co., 1515 Broad St., Bloomfield, N.J. 07003 (subsidiary of Combustion Engineering)
3M Co., 3M Ctr., St. Paul, Minn. 55144
Mallory Components Group, 3029 East Washington St., Indianapolis, Ind., 46206 (part of Emhart Corp.)
Manville Corp., Ken-Caryl Ranch, Denver, Colo. 80217
Marcor, 535 West Chicago Ave., Chicago, Ill. 60610
Martin Marietta Corp., 6801 Rockledge Dr., Bethesda, Md. 20034
Masonite Corp., P.O. Box 1048, Laurel, Miss. 39440
McDonnell Douglas Corp., P.O. Box 516, St. Louis, Mo. 63166
McGaw Laboratories, P.O. Box 11887, Santa Ana, Calif. 92711 (division of American Hospital Supply Corp.)
McGraw-Edison Co., 1701 Golf Rd., Rolling Meadows, Ill. 60008
Meloy Laboratories, 6715 Electronics Dr., Springfield, Va. 22151 (subsidiary of Revlon)
Millipore Corp., 80 Ashby Rd., Bedford, Mass. 01730
Mine Safety Appliances Co., 608 Penn Center Blvd., Pittsburgh, Pa. 15235
Philip Morris, 100 Park Ave., New York, N.Y. 10017
Motorola, 1303 East Algonquin Rd., Schaumburg, Ill. 60196
MRC Corp., 11212 McCormick Rd., Hunt Valley, Md. 21031
Nashua Corp., 44 Franklin St., Nashua, N.H. 03061
National Can Corp., 5959 South Cicero Ave., Chicago, Ill. 60638
National Gypsum Co., 4100 First International Bldg., Dallas, Tex. 75270
NCR Corp., 1700 South Patterson Blvd., Dayton, Ohio 45479
Nicolet, Ford & Washington St., Norristown, Pa. 19401
NL Industries, 1230 Ave. of the Americas, New York, N.Y. 10020
Northern Gas Products Co., 2223 Dodge St., Omaha, Neb. 68102 (part of InterNorth)
Norton Co., 50 New Bond St., Worcester, Mass. 01606
Owens-Corning Fiberglas Corp., Fiberglas Tower, Toledo, Ohio 43659
Owens-Illinois, P.O. Box 1035, Toledo, Ohio 43666
Para-Chem, Ontario and Rorer St., Philadelphia, Pa. 19114
Parkson Corp., 5601 Northeast 14th Ave., Ft. Lauderdale, Fla. 33334 (subsidiary of A. Johnson Co.)
Ralph M. Parsons Co., 100 West Walnut St., Pasadena, Calif. 91124
PCR, P.O. Box 1466, Gainesville, Fla. 32601 (part of organic chemicals division of SCM Corp.)
Perkin-Elmer Corp., Main Ave., Norwalk, Conn. 06856
Pierce & Stevens Chemical Corp., 724 Ohio St., Buffalo, N.Y. 14203 (division of Pratt & Lambert)
Polaroid Corp., 549 Technology Sq., Cambridge, Mass. 02139
Polymer Applications, 3443 River Rd., Tonawanda, N.Y. 14150
Polymer Industries, P.O. Box 2184, Greenville, S.C. 29602 (subsidiary of Philip Morris)
Pratt & Whitney Aircraft Group, 400 Main St., East Hartford, Conn. 06108 (division of United Technologies Corp.)
Pullman Power Products, P.O. Box 3308, Williamsport, Pa. 17701 (division of Wheelabrator-Frye)
Radiation Management Corp., 3508 Market St., Philadelphia, Pa. 19104
Raychem Corp., 300 Constitution Dr., Menlo Park, Calif. 94025
RCA Corp., 30 Rockefeller Plaza, New York, N.Y. 10020
Research-Cottrell, P.O. Box 1500, Somerville, N.J. 08876
R.J. Reynolds Industries, 401 North Main St., Winston-Salem, N.C. 27102
H. H. Robertson Co., 400 Holiday Dr., Pittsburgh, Pa. 15220
Rockwell International Corp., 600 Grant St., Pittsburgh, Pa. 15219
Sargent-Welch Scientific Co., 7300 North Linder Ave., Skokie, Ill. 60077
Jos. Schlitz Brewing Co., 235 West Galena St., Milwaukee, Wis. 53201 (subsidiary of Stroh Brewery Co.)
Scientific Design Co., 2 Park Ave., New York, N.Y. 10016 (subsidiary of Halcon International)
SCM Corp., 299 Park Ave., New York, N.Y. 10017
Sears, Roebuck & Co., Sears Tower, Chicago, Ill. 60684
Signal Cos., P.O. Box 2829, La Jolla, Calif. 92037
Singer Co., 8 Stamford Forum, Stamford, Conn. 06904
SmithKline Beckman Corp., 1500 Spring Garden St., Philadelphia, Pa. 19101
Spectra-Physics, 3333 North First St., San Jose, Calif. 95134
Sprague Electric Co., 149 Marshall St., North Adams, Mass. 01247
J.P. Stevens & Co., 1185 Ave. of the Americas, New York, N.Y. 10036
Stone & Webster Engineering Corp., P.O. Box 2325, Boston, Mass. 02107 (subsidiary of Stone & Webster)
Swedlow, 12122 Western Ave., Garden Grove, Calif. 92645
Teepak, 2 North Riverside Plaza, Chicago, Ill. 60606 (member of Continental Group)
Tektronix, P.O. Box 1700, Beaverton, Ore. 97075
Texas Instruments, P.O. Box 225012, Dallas, Tex. 75222
Thiokol Corp., Newtown-Yardley Rd., Newtown, Pa. 18940
U.S. Gypsum Co., 101 South Wacker Dr., Chicago, Ill. 60606
United Technologies Corp., 1 Financial Plaza, Hartford, Conn. 06101
UOP, 10 UOP Plaza, Algonquin Rd., Des Plaines, Ill. 60016 (subsidiary of Signal Cos.)
Varian Associates, 611 Hansen Way, Palo Alto, Calif. 94303
Jim Walter Corp., 1500 North Dale Mabry Hwy., Tampa, Fla. 33607
Western Electric Co., 222 Broadway, New York, N.Y. 10038 (division of American Telephone & Telegraph Co.)
Westinghouse Electric Corp., 3 Gateway Ctr., Pittsburgh, Pa. 15222
Xerox Corp., High Ridge Park, Stamford, Conn. 06904
Zenith Radio Corp., 1000 North Milwaukee Ave., Glenview, Ill. 60025

Research

Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill. 60439
Battelle Columbus Laboratories, 505 King Ave., Columbus, Ohio 43201
Battelle Pacific Northwest Laboratories, P.O. Box 999, Richland, Wash. 99352
Bell Laboratories, 600 Mountain Ave., Murray Hill, N.J. 07974 (division of American Telephone & Telegraph Co.)
Brookhaven National Laboratory, Upton, Long Island, N.Y. 11973
Chemical Abstracts Service, P.O. Box 3012, Columbus, Ohio 43210
Commercial Testing & Engineering Co., 228 North La Salle St., Chicago, Ill. 60601 (division of GEO International Corp.)
Denver Research Institute, University of Denver, University Park, Denver, Colo. 80208
Exxon Research & Engineering Co., P.O. Box 221, Florham Park, N.J. 07932 (division of Exxon Corp.)
Franklin Institute, 20th & Race St., Philadelphia, Pa. 19103
Gillette Research Institute, 1413 Research Blvd., Rockville, Md. 20850
IIT Research Institute, 10 West 35th St., Chicago, Ill. 60616
Institute of Gas Technology, 3424 South State St., Chicago, Ill. 60616
Institute of Paper Chemistry, P.O. Box 1039, Appleton, Wis. 54912
Lawrence Berkeley Laboratory, University of California, 1 Cyclotron Rd., Berkeley, Calif. 94720
Lawrence Livermore National Laboratory, University of California, Berkeley, Calif. 94720
Arthur D. Little Inc., Acorn Park, Cambridge, Mass. 02140
Los Alamos National Laboratory, P.O. Box 1663, Los Alamos, N.M. 87545
Materials Research Laboratory, University of Illinois, Urbana, Ill. 61801
Mellon Institute, Carnegie-Mellon University, 4400 Fifth Ave., Pittsburgh, Pa. 15213
Midwest Research Institute, 425 Volker Blvd., Kansas City, Mo. 64110
Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, Tenn. 37830
Rand Corp., 1700 Main St., Santa Monica, Calif. 90406
Research Triangle Institute, P.O. Box 12194, Research Triangle Park, N.C. 27709
Sandia National Laboratories, P.O. Box 5800, Albuquerque, N.M. 87115
Foster D. Snell Inc., 66 Hanover Rd., Florham Park, N.J. 07932 (division of Booz, Allen & Hamilton)
Southern Research Institute, 2000 Ninth Ave. South, Birmingham, Ala. 35255
Southwest Research Institute, 6220 Culebra Rd., San Antonio, Tex. 78284
SRI International, 333 Ravenswood Ave., Menlo Park, Calif. 94025
Sterling-Winthrop Research Institute, Columbia Tpke., Rensselaer, N.Y. 12144 (division of Sterling Drug)
Syracuse Research Corp., Merrill La., Syracuse, N.Y. 13210
Underwriters Laboratories, 333 Pfingsten Rd., Northbrook, Ill. 60062
United States Testing Co., 1941 Park Ave., Hoboken, N.J. 07030 □